

Association Between Patient Knowledge and The Success of Retainer Treatment In Preventing Orthodontic Relapse Among Adolescents: A Cross-Sectional Study

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Abstract.

Background: Orthodontic relapse remains a common complication after active treatment, with reported rates of 70-90% during the retention period, and retainer-related failure is a major contributing factor. Because the long-term stability of orthodontic correction depends heavily on the patient's own adherence to retainer wear, patient knowledge of the purpose, protocol, and consequences of neglecting retention is considered an important determinant of treatment success, yet this relationship has received limited attention in the orthodontic literature. **Objective:** This study aimed to evaluate the association between patient knowledge and the success of retainer treatment in preventing orthodontic relapse. **Materials and Methods:** This retrospective cross-sectional study included 33 orthodontic patients over 18 years of age who were undergoing the retention phase after active treatment at Nala Husada Dental Hospital, Surabaya, Indonesia, between November 2024 and February 2025. Data were collected using a structured online questionnaire distributed through Google Forms, consisting of 12 items covering patient knowledge, therapeutic communication, and compliance regarding retainer use. Responses were coded numerically, and the association between patient knowledge and the success rate of retainer treatment was analyzed using the Spearman rank correlation test, with statistical significance set at $p < 0.05$. **Results:** Female participants constituted the majority of respondents (81.8%). Most participants demonstrated a very good level of knowledge regarding retainer treatment (72.7%), while 18.2% had poor knowledge and 9.1% had very poor knowledge. A significant positive correlation was found between patient knowledge and the success rate of retainer treatment ($r = 0.671$; $p = 0.024$), indicating a strong relationship: patients with greater knowledge of retainer care achieved more successful treatment outcomes. **Conclusion:** Patient knowledge was significantly associated with the success of retainer treatment in preventing orthodontic relapse. These findings underscore the importance of structured patient education during the retention phase to improve long-term orthodontic stability.

Keywords: Orthodontic retention, orthodontic relapse, patient knowledge, retainer compliance, therapeutic communication and treatment success.

I. INTRODUCTION

Relapse is a common problem that occurs in people who have completed orthodontic treatment and it is reported that around 70-90% of cases occur with varying degrees of severity during the retention period. Relapse means the teeth return to their original position before orthodontic treatment [1]. According to previous research, 41.3% of relapses could occur due to retainer failure [2]. Hawley retainers are most frequently lost, accounting for 52% of failures, whereas vacuum-formed retainers are more likely to break or change color, with a probability of 43.48% [3].

Retainers are used by patients for 6-12 months after orthodontic treatment is completed and must be used routinely because soft and hard tissue remodeling occurs during this period so it is very important to use them after orthodontic treatment [4]. Retainers in orthodontics can be classified into removable and fixed retainers, as well as retainers visible and invisible. Each type has advantages and disadvantages [5].

Patient involvement in choosing a retainer is very influential in increasing the success of treatment. The dentist and patient must discuss together the choice of retention device so that the patient can be motivated to use the retainer regularly to prevent relapse [6]. Patient awareness emerges as a critical determinant of orthodontic stability. Individuals cognizant of the importance of retainer therapy demonstrate superior adherence to prescribed wearing schedules. In contrast, a deficit in patient understanding, often stemming from insufficient clinical guidance, directly correlates with a sharp reduction in retainer use over the short term [7].

The two most frequently utilized types of removable retainers (RRs) are the Hawley retainer and the vacuum-formed retainer (VFR). Hawley Retainers are produced using resin self-curing (based monomer on

methyl methacrylate) [8]. A vacuum-formed retainer is made from a thermoplastic sheet (polyethylene terephthalate glycol copolymer, 0.040" in thickness) that is heated and compressed inside a vacuum apparatus against the patient's mold, according to the manufacturer's instructions, then trimmed into a horseshoe shape [9]. The vacuum-formed retainer is quite thin but has high resistance, making it strong and not easily damaged [10]. There is an increase in plaque accumulation in the internal retaining area of retainer due to poor oral hygiene by the user [11].

Knowledge or erudition is the result of human sensing or the result of a person's knowledge of an object through his or her five senses. The Aristotle list of the five human senses for sensing objects are sight, hearing, smell, taste, and touch. When sensing to produce knowledge it is influenced by the intensity of attention and perception of the object. A person's knowledge is mostly obtained through the sense of hearing and the sense of sight [12]. Patient adherence to a common retainer protocol full-time wear for six months, removable for eating and hygiene is challenged by a documented lack of knowledge. Studies report that upon debonding, only 45.7% to 79.9% of patients possess adequate understanding of their retainer regimen, highlighting a critical need for improved patient education [12].

The success rate of retainer treatment depends not only on the doctor but also on the patient's cooperative attitude in using the retainer. Inadequate patient adherence both during active orthodontic therapy and the post-treatment phase can lead to suboptimal treatment results, unwanted side effects, prolonged treatment duration, and an increased risk of relapse following treatment completion. In the context of general healthcare, patient adherence is commonly described as the degree to which an individual's actions align with medical or health recommendations. However, a standardized definition of adherence specific to orthodontics has not been firmly established. Within orthodontic practice, adherence is typically understood as patients' compliance with appliance-wear instructions, regular attendance at scheduled appointments, and the maintenance of appropriate oral hygiene [13].

The severity of the case also influences the success rate of retainer treatment. The rationale for non-compliance with removable retainers is multifaceted. Key barriers include a diminished motivation to sustain occlusal stability, the physical discomfort associated with wear, functional limitations that interfere with eating and speaking, and the practical risk of losing the appliance [14]. The novelty of this study is its focus on examining the association between patient knowledge and the success of retainer therapy in preventing orthodontic relapse, a topic that has received limited attention in previous research. Accordingly, this study aims to assess the relationship between patient knowledge and the effectiveness of retainer treatment after orthodontic care.

II. METHODS

This retrospective cross-sectional study employed an observational analytical design involving 33 orthodontic patients undergoing the retention phase after active orthodontic treatment at Nala Husada Dental Hospital, Surabaya, Indonesia, between November 2024 and February 2025.

Data were collected using a structured online questionnaire distributed through Google Forms. The questionnaire consisted of 12 items evaluating patient knowledge, therapeutic communication, and patient compliance regarding retainer use. Ethical approval was granted by the hospital's Ethical Research Commission (Ethical Clearance No. EC/012/KEPK.RSGMNH/II/2024).

The independent variable in this study is the patient's knowledge of retainers. The dependent variable in this study is the success rate of retainer treatment. The samples taken in this research must be representative based on the inclusion criteria where research subjects can represent the sample research that meets the requirements as a sample study. The following are the conditions for the research:

1. Patients who have used or are currently using a Hawley or vacuum-formed retainer at RSGM Nala Husada Surabaya (Figure 1).
2. Patients over 18 years old who were willing to participate as respondents by completing the online questionnaire in full.

Statistical analysis was performed using IBM SPSS Statistics version 28.0. The association between patient knowledge and the success rate of retainer treatment was analyzed using the Spearman rank

correlation test, with statistical significance set at $p < 0.05$. The resulting correlation coefficient (R-value) indicated the strength of the relationship between patient knowledge and the success rate of retainer treatment in preventing relapse.



(a). Hawley Retainer

(b). Vacuum-formed retainer

Fig 1. Types of removable retainers used by study participants a) Hawley retainer; (b) vacuum-formed retainer

III. RESULT AND DISCUSSION

Table 1. Gender Characteristics of Study Participants

Gender	N	%
Male	6	18,2
Female	27	81,8
Total	33	100,0

Table 2. Respondents' Knowledge Levels Regarding Retainer Treatment

Category	N	%
Very Good	24	72,7
Bad	6	18,2
Very bad	3	9,1
Total	33	100,0

Table 3. Correlation analysis between patient knowledge and success rate of retainer treatment

Correlation		
Patient Knowledge of Treatment Success Rates Retainer		
Patient Knowledge of Treatment Success Rates	Correlation Co-efficient	0.671
	Sig. (2-tailed)	0.024
	N	33

Data in this study were obtained from a questionnaire. A total of 33 questionnaires were distributed, each consisting of 12 questions covering three main aspects: patient knowledge factors, therapeutic communication between dentists and patients, and patient compliance factors. After data collection, coding was performed to transform the responses into numerical values. The next stage involved calculating the mean value of the coded data, followed by rounding the results to facilitate data interpretation and further statistical analysis. As shown in Table 1, the majority of respondents were female, with 27 respondents (81.8%).

As shown in Table 2, the majority of respondents had very good knowledge, with 24 respondents (72.7%).

The Spearman rank correlation results as in Table 3 show that the correlation coefficient value between patient knowledge and the level of success of retainer treatment is 0.671, which means a strong correlation relationship.

The p-value obtained was smaller than the significance level of 5% ($0.024 < 0.05$); therefore, H_0 was rejected, indicating a significant correlation between patient knowledge and the success rate of retainer treatment.

Relapse is the loss of dental correction that has been achieved in orthodontic treatment. For patients, relapse is defined as a change in the final position of the teeth after treatment [15]. Relapse can occur due to several factors, one of the failures can be caused by the retainer itself. Failure can include the retainer breaking, changing color, or missing [16]. Prior to initiating orthodontic therapy, patients must be thoroughly informed that the retention phase is an integral component of the overall treatment. They should understand that they bear primary responsibility for this phase and that a lack of adherence will compromise the stability of the corrective results [17].

The majority of previous studies indicate that gender is not a statistically significant predictor of orthodontic appliance wear time. This consensus is challenged by a single study by Pratt et al., which reported that females demonstrated significantly higher compliance rates than males at a six-year post-treatment follow-up [18]. Similar with previous study, regarding the association between compliance and gender, no significant difference was found ($p > 0.05$). However, female patients were more likely to wear their retainers longer than male [8].

The determinants of patient compliance are complex and multifaceted. Key influential factors include socioeconomic and demographic characteristics, educational attainment, the quality of the doctor-patient relationship, and familial support. In contrast, Wafaie et al found no statistically significant correlation between compliance levels and patient age, gender, or the type of retainer prescribed [19].

Knowledge is the most important factor to support successful treatment. Knowledge is a learning process using the five senses that a person carries out on certain objects to produce knowledge and skills [16]. A person's knowledge can arise from various sources and facilities. Patient education constitutes a fundamental preventive strategy against orthodontic relapse. To foster compliance, patients require thorough instruction on the causes of relapse and the importance of retainer adherence, including protocols for wear, hygiene, and lifestyle adjustments. This knowledge empowers patients, directly contributing to improved treatment outcomes by reducing the likelihood of relapse [20].

The correlation between patient knowledge and treatment success underscores the critical role of patient education. Evidence indicates that patients with greater orthodontic knowledge exhibit more positive attitudes toward treatment, which is associated with improved clinical outcomes. The orthodontist and their team are responsible for evaluating compliance and educating patients throughout the treatment process. Assessing a patient's Knowledge, Attitude, and Practice (KAP) beforehand is therefore instrumental, enabling clinicians to predict adherence and develop targeted strategies to enhance it, thereby optimizing treatment results.

The knowledge and awareness of orthodontic patients regarding the potential for orthodontic relapse, as evidenced by the distribution of knowledge levels across the sampled population. With a total of 304 respondents, the findings indicate that a significant proportion, 42.8%, possess a moderate level of knowledge, suggesting that while they have some understanding of the implications surrounding orthodontic treatment and the risk of relapse, there remains ample room for enhancement in their awareness. Furthermore, a notable 35.2% of patients were categorized as having a low level of knowledge, raising concerns about their preparedness and ability to adhere to recommended post-treatment protocols, which are essential for minimizing the likelihood of relapse [21].

This condition makes an opportunity for orthodontic practitioners to develop and implement more effective educational strategies aimed at improving patient understanding, thereby potentially reducing the incidence of relapse and promoting better long-term treatment outcomes. Enhanced educational initiatives could include patient seminars, informative literature, and follow-up consultations to reinforce the importance of retention measures and address any misconceptions regarding orthodontic care [22].

The results of the Spearman rank correlation test show that the correlation coefficient value between patient knowledge and the level of success of retainer treatment is 0.671, which means a strong correlation relationship. This means that the higher the patient's knowledge, the higher the success rate of retainer

treatment. In this study, patient knowledge was the most dominant factor and had a major influence on the success rate of retainer treatment. Someone who has a low level of knowledge tends to find it difficult to respond to the information provided so it is difficult to make a decision when facing a choice. In this case, knowledge has an important influence in determining which retainer treatment to use [12].

Patient awareness of retention is often limited to a general concept. While most individuals understand that a retainer is necessary upon treatment completion, their comprehension of essential implementation details, including retainer selection, long-term duration, and daily wear requirements, consistently shows significant gaps [23].

The Knowledge, Attitude, and Practice (KAP) survey is a foundational diagnostic instrument in health literacy, used to assess a population's understanding, perceptions, and behaviors. Its theoretical framework posits a causal pathway where knowledge informs attitudes, which in turn govern practices [12].

Consistent with existing literature, this study corroborates that in oral health, greater knowledge fosters an enhanced awareness of its importance, which in turn leads to improved health outcomes [24]. The literature consistently demonstrates that heightened oral health literacy promotes awareness, encourages preventive self-monitoring behaviors, and is directly linked to better clinical results, related to this research a significance value was obtained and the Spearman rank correlation test value was 0.739, which means there is a strong correlation. These findings suggest that improved patient knowledge may contribute to better adherence to retainer protocols and enhanced post-treatment stability [25].

Kanizaj et al demonstrated that patient education using visual aids, which illustrated the severe consequences of biofilm accumulation, led to significant improvements in oral hygiene. Based on this, the authors hypothesized that adolescent non-compliance stems primarily from cognitive immaturity and a lack of specific knowledge regarding orthodontic treatment, particularly the importance of the retention phase [26]. To secure optimal oral health outcomes, orthodontic care must integrate two key strategies from the outset: first, the provision of thorough education and ongoing support, and second, the active promotion of positive attitudes and beliefs. These psychological factors are vital for bridging the gap between patient knowledge and the implementation of long-term, health-promoting behaviors [27].

Consistent with these findings, a related study reported significant deficits in the understanding of orthodontic principles, including post-treatment tooth movement and retention, among a sample of dental students. This finding highlights a critical gap in oral health literacy that necessitates more effective patient education strategies. Furthermore, the self-reported disconnect between knowledge and personal behavior in that cohort aligns with established behavioral science, which posits that knowledge is merely one component in a complex, multifactorial system governing behavioral change [28].

The limitation of this study is that it employed a cross-sectional design, which restricts the ability to establish causal relationships between patient knowledge, compliance, and the success of retainer treatment. The use of self-reported questionnaires may also introduce reporting and social desirability bias, as respondents could overestimate their level of knowledge or compliance [29]. In addition, the study population was limited to a specific demographic group, which may affect the generalizability of the findings to broader orthodontic patient populations with different socioeconomic, cultural, or clinical characteristics. Furthermore, other potential influencing factors such as psychological motivation, clinician communication styles, and objective clinical measurements of retainer wear were not assessed, which may have contributed to unexplained variability in treatment outcomes [30].

IV. CONCLUSION

Patient knowledge was significantly and strongly associated with the success of retainer treatment in preventing orthodontic relapse ($r=0.671$; $p=0.024$), with better-informed patients achieving more favorable outcomes during the retention phase. These findings highlight the importance of structured patient education in supporting long-term orthodontic stability.

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