



Original article

Orthodontic Patients' Knowledge and Understanding of Orthodontic Retainers: A cross sectional study

Fatma Fenesh, ¹ Sara Elhabony ²

¹Assistant lecturer, Department of Orthodontics, Faculty of Dentistry, University of Benghazi.

²General dental practitioner.

ABSTRACT

Objectives: To assess the dental patients' knowledge and understanding of orthodontic retainers, and to evaluate the level of knowledge in relation to different predefined variables such as gender, onset of treatment and education level.

Materials and Methods: This is a cross sectional questionnaire-based study involving patients undergoing active orthodontic treatment. A validated and piloted questionnaire was distributed around five orthodontic clinics in Benghazi city. The paper questionnaire consisted of four sections with 20 questions covering basic demographic data, the knowledge and understanding of orthodontic retainers, and finally the mode of information provision. Descriptive statistics were carried out for frequency and proportions. In addition, the relationship between the variables was analysed using Chi-Square and Fisher exact test. A simple thematic analysis was conducted for the open-ended questions.

Results: The response rate was 95%. A total of 295 questionnaires were self-completed and collected from the five centres. The age range was between 16 - 53 years (mean age 24.3). Around 83.4% of patients were aware that they will require a set of orthodontic retainers at the end of treatment. However, only half of the patients knew what type of retainers they will require (56.9%). Regarding the understanding of retention and relapse, around 71.2% of patients understood why retainers are needed and 60% recognize what will happen if they didn't wear their retainers. However, only 34% of the respondents understand what "orthodontic relapse" means. No association was found between the onset of treatment, age and gender and the patients' level of knowledge and understanding of orthodontic retainers. Nevertheless, the level of education was the only variable shown to be associated with the level of patients' understanding.

Conclusions: The level of knowledge and understanding regarding orthodontic retainers was suboptimal among Libyan orthodontic patients. The reported lack of knowledge could potentially influence the amount of compliance with wearing orthodontic retainers. Postgraduate students and professionals seem to be more attentive to instructions and maintaining their teeth in place.

Key words: Retention, questionnaire, knowledge, orthodontic patients.

Corresponding author:

Fatma Fenesh: Department of Orthodontics,
Faculty of Dentistry, University of Benghazi
E-mail: fatma.fenesh@gmail.com

INTRODUCTION

Retention is an integral part of orthodontic treatment to maintain the teeth in their corrected position following active tooth movement. Relapse is considered one of the challenging risks in orthodontics due to the various causative factors involved in moving the teeth back into their initial position. These include periodontal, gingival, occlusal, soft tissue factors and growth.¹ Relapse is

not only the return of the original features of malocclusion, but also changes that occur as part of the ageing-process, which can be difficult to predict and vary between individuals. For these reasons, the need for lifelong retention has been widely advocated to ensure long-term stability of the treated malocclusion.² Orthodontic retainers have been investigated extensively in the literature and perhaps the best available evidence comes from an updated Cochrane systematic review which concluded there is no evidence to recommend one retainer over the other.³ Whilst there have been many studies investigating the effectiveness of different types of retainers, not much work has been done on the patients' perception of orthodontic retainers.

During the last 10 years there has been a paradigm shift in healthcare from the disease-centred approach to patient-centred approach generating many new concepts such as, evidence-based dentistry, patient reported outcome measures, and shared decision making (SDM).⁴ Patients' values and preferences form a fundamental element of evidence-based dentistry and applying SDM in orthodontics is particularly important for many reasons. First, orthodontic treatment can carry few risks such as, root resorption and demineralization and hence a good discussion with the patient is required to weigh the benefits of treatment against these risks.⁵ Secondly, a patient's perception of aesthetics is different to the orthodontist's perception and in order to meet patients' expectations, it's important to understand their views and opinions regarding their treatment. And finally, there are many treatment modalities in orthodontics and each case can be treated using different techniques and appliances. Therefore, efficient communication and information exchange can help the orthodontist formulate the best suitable treatment plan for the patient and enhance the decision-making process.⁶

The need for orthodontic retainers should be discussed with the patient from the onset of treatment as part of the informed consent process.^{7,8} Orthodontic treatment is a lengthy procedure that can take up to 20 months on average and good compliance is key for achieving a successful treatment outcome.⁹ Studies have shown that patients are more compliant when they are well-informed and engaged in the decision-making process.¹⁰⁻¹² Furthermore, compliance with orthodontic removable retainers can be a challenging task and various methods to enhance patients' compliance has been reported in several studies. Factors such as forgetfulness, negative patients' beliefs, and the lack of understanding of the importance of the retention phase have been documented.¹³ In the light of all this more research is required to assess the patients' perception and awareness regarding orthodontic retainers and the amount of information patients can actually retain during treatment. Thus, the aim of this study is to explore the patients' knowledge and understanding of orthodontic retainers and evaluate its' association to different variables such as gender, education level and onset of treatment.

MATERIAL AND METHODS:

This cross-sectional study was described according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. Ethical approval was obtained from the Dental Ethics Approval Committee at the Faculty of Dentistry - University of Benghazi (reference number 092). All patients' data and information were confidential and

accessed only by the principal investigators. No personal data was collected, and all the data was coded during the statistical analysis. A self-administered paper questionnaire was distributed at the reception area of each clinic to consecutive patients as they walked in. After a brief explanation of the nature of the study and reading the information sheet attached with the questionnaire, the participants were asked to sign the consent form. Instructions were given with the help of a dental assistant to fill the questionnaire independently and anonymously with no time restriction before or after their appointments. The questionnaire was then placed into a sealed envelope and dispensed back into a box at the waiting area by the patients themselves to ensure anonymity. The inclusion criteria included patients speaking Arabic as their first language, aged 16 years or above, receiving orthodontic treatment for the first time and willing to take part in the study. A priori sample size calculation was based on a previous study¹⁴ and the formula of survey sampling by Kish.¹⁵ A minimum sample of 278 was needed with a margin of error set at 5% and a confidence level at 95%. To compensate for an anticipated nonresponse rate of 15%, a total sample of 310 will be required to maximise the response rate. The sample was recruited using a convenient random sampling method.

Development of the questionnaire:

The process of developing the questionnaire involved 7 stages (Table 1) as described by.^{16,17} The questionnaire included four sections; section (1) included items related to the patients' demographic and sociocultural data, section (2) included items on the knowledge of orthodontic retainers, section (3) included questions on the understanding of patients on orthodontic retention and section (4) contained questions on the means of information delivery and communication including 3 pictures of three types of orthodontic retainers. The type of questions included were a mix of open and closed ended questions. Open ended questions would provide a deeper insight into the patients' understanding than yes/no questions.

Table 1: Stages of Questionnaire Development

Stage 1	Defining a research question	
Stage 2	Development of the questionnaire content	• Reviewing the literature to identify questionnaires used in previous studies (14)(18).
Stage 3	Questionnaire formatting	• Item selection by a panel of expert orthodontist (FS, MB, RA) • Questionnaire design
Stage 4	Readability test	• Gunning fog test score (75%)
Stage 5	Translation	• Questionnaire was translated by a professional translator.
Stage 6	Pre-piloting	• Testing the questionnaire on a similar group of lay people to assess face validity. • Making any amendments if required.
Stage 7	Testing and piloting	• Piloting the questionnaire on a similar group of orthodontic patients 2 weeks apart to assess validity, reliability and acceptability.

Questionnaire validation:

The questionnaire layout and questions format were evaluated with a group of orthodontists (expert panel) initially to identify any potential ambiguous questions and make sure the subjects can navigate easily through the questionnaire. Any amendments required were made before pre-piloting the questionnaire on a small group of lay people to make sure the questionnaire was clear and acceptable to the respondents.

In order to test the questionnaire for any potential problems the questionnaire was then piloted on a similar group of patients 2 weeks apart. The two sets of responses were compared using Kappa statistics for categorical data. During this, the validity, reliability and acceptability of the questionnaire was tested.

Statistical analysis:

All statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS), version 20 (SPSS Inc., Chicago, Illinois, USA). The level of statistical significance was set at $p < 0.05$. Descriptive statistics were conducted for the counts and percentages of each question item. Frequencies and proportions were calculated for the basic demographic data. The association between the dependent variables (knowledge and understanding of retention) and independent variables (gender, treatment onset and educational level) was analysed using chi-square and Fisher exact test. A simple thematic analysis was carried out for the open-ended question regarding why orthodontic retention is important.

RESULTS:

The questionnaire response rate was 95%. Out of 310 questionnaires distributed, a total number of 295 were completed and returned back. The lowest kappa score was 0.8 showing good questionnaire reliability. The demographic characteristics of the respondents are presented in table 2. The age range was between 16 - 53 years (mean age 24.3) with 74.6% of the respondents being females and 25.4% males. The majority of the respondents had their appliances fitted for more than 6 months (63.4%) and 36.6% reported they started their orthodontic treatment during the past 6 months. Regarding the level of education; 65.1% of the respondents were university graduates, 31.5% were secondary school students, and only 3.4% were postgraduate students and professionals.

Table 2: Demographic Characteristics of respondents (n=295)

Characteristic	Percentage%	Frequency
Age (years)		
<21	34.5	102
21-30	49.1	145
31-40	14.5	43
>40	1.6	5
Gender		
Female	74.6	220
Male	25.4	75
Onset of treatment		
< 6 months	36.6	108
> 6 months	63.4	187
Education level		
Secondary	31.5	93
Graduate	65.1	192
Postgraduate	3.4	10

Overall, the respondents showed moderate knowledge on orthodontic retainers as 83.4% of patients were aware, they will require a set of retainers at the end of treatment. However, only half of the patients knew what type of retainers they will need (56.9%) and 45% knew how long they are required to wear their retainers for. Similarly, when asked about the number of hours, only 34.9% reported they know how many hours they need to wear their retainers during the day.

Around 71.2% of patients understood why retainers are needed. The most common answers and comments for those who responded "yes" regarding why orthodontic retainers are needed are presented in table 3. Another 60% appreciate what would happen if they stopped wearing their retainers. However, only 39% of the respondents reported they understand the meaning of "orthodontic relapse". Proportions of responses to the knowledge and understanding questions are presented in figure 1 and figure 2.

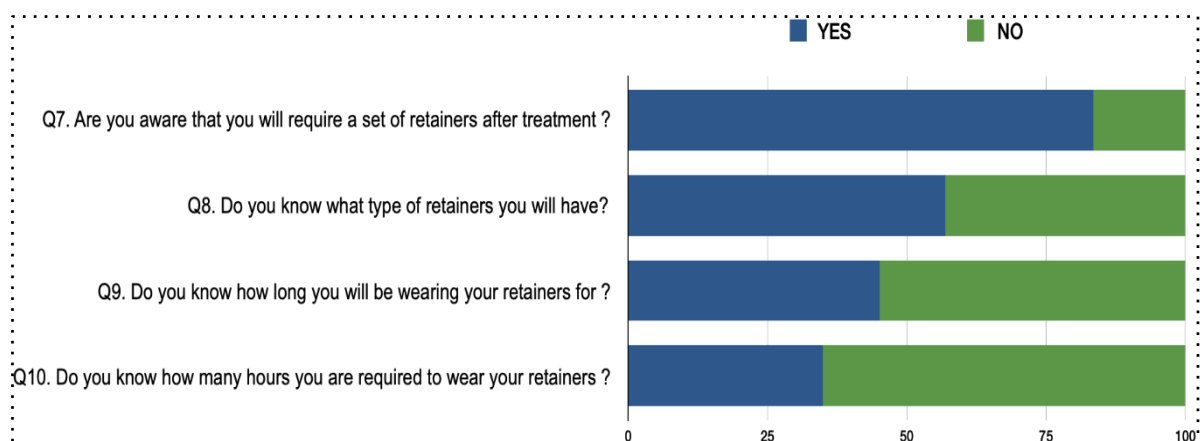
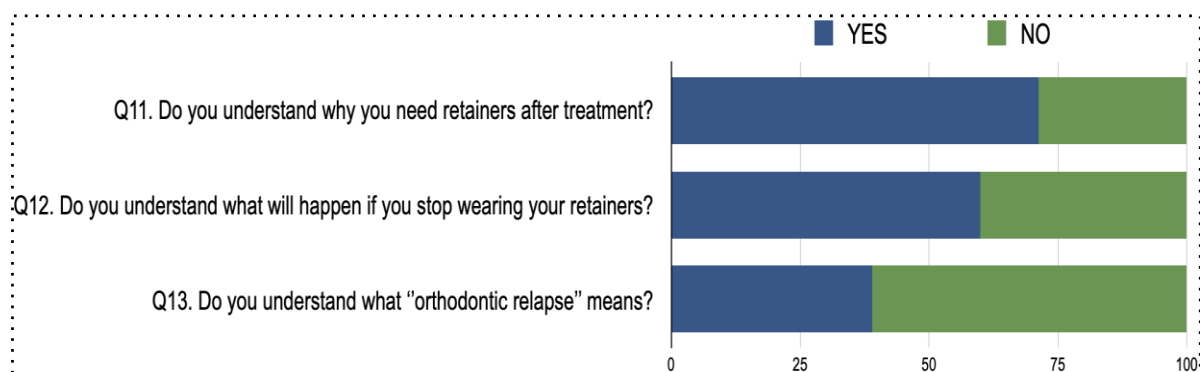
**Figure 1:** Proportion of responses to knowledge-based questions on orthodontic retainers**Figure 2:** Proportion of responses to understanding based questions on orthodontic retainers

Table 3: The effect of gender, onset of treatment and education level on the responses to knowledge-based questions.

Variable	Q 7	Q 8	Q 9	Q10
Gender	0.846 (NS)	0.153 (NS)	0.450 (NS)	0.240 (NS)
Onset of treatment	0.109 (NS)	0.067 (NS)	0.867 (NS)	0.605 (NS)
Education level	0.006 (NS)	0.036 (NS)	0.522 (NS)	0.642 (NS)
Chi-square test. Fisher exact test. P value < 0.05				

Regarding the importance of orthodontic retainers; approximately 90% of patients believed that orthodontic retainers are very important and important collectively, and only a 12% responded that retainers are not important (figure 3). Variables such as the onset of treatment, age and gender didn't seem to influence the patients' level of knowledge of orthodontic retention (Table 3). The level education was the only factor that influenced the understanding of patients on orthodontic retention (Table 4). A statistical difference was found between education and the reason why orthodontic retainers are needed ($P < 0.000$), the consequences of stop wearing retainers after treatment ($P < 0.021$), and the meaning of orthodontic relapse ($P < 0.014$). A simple thematic analysis carried for an open-ended question regarding the reasons for wearing retainers at the end of treatment is presented in table 5.

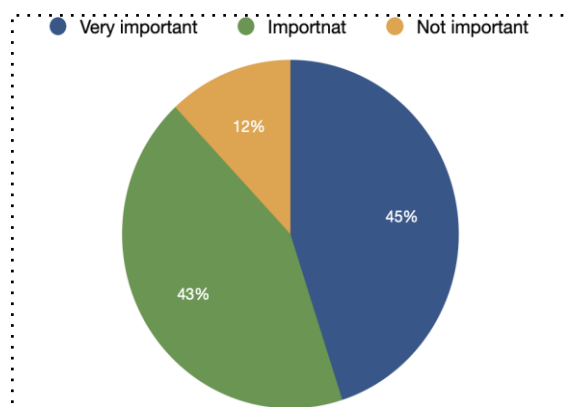


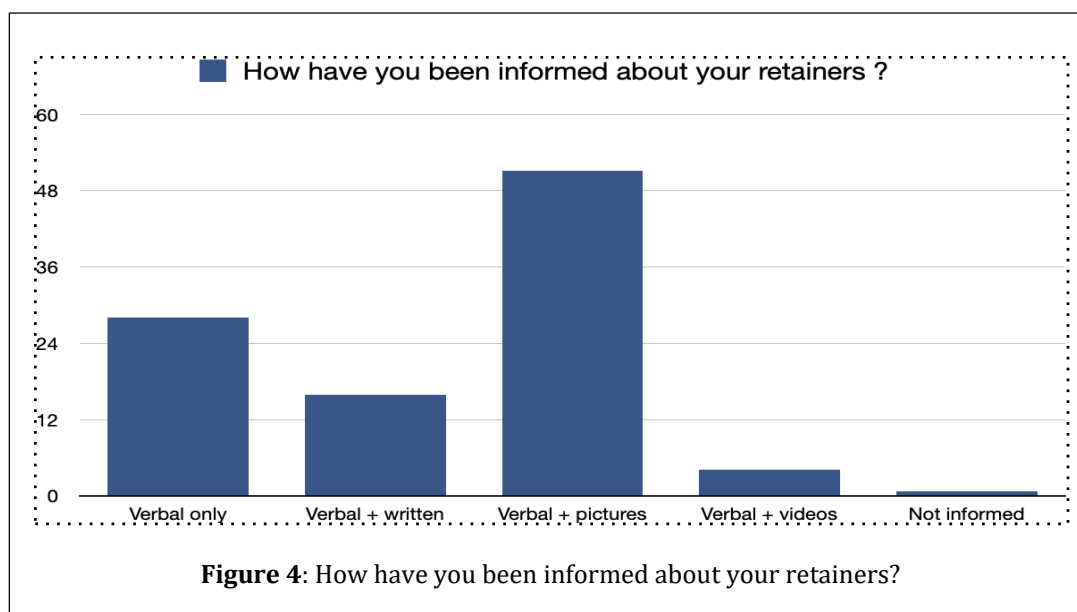
Figure 3: How important do you think orthodontic retainers are?

Table 4: The effect of gender, onset of treatment and education level on the responses to understanding based questions.

Variable	Q 11	Q 12	Q 13
Gender	0.908 (NS)	0.029 (NS)	0.087 (NS)
Onset of treatment	0.193 (NS)	0.152 (NS)	0.980 (NS)
Education level	0.000 (SS)	0.021 (SS)	0.014 (SS)
Chi-square test. Fisher exact test. P value < 0.05			

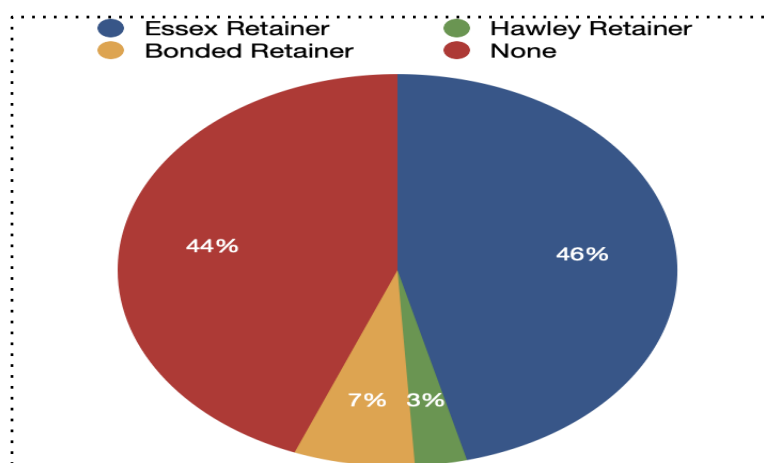
Table 5: Simple themes identified from the responses to the questions:
Do you understand why you need orthodontic retainers at the end of treatment?

Theme	Patients' comments
Success of treatment	"Maintaining the teeth in place will help achieve a successful outcome" "Because wearing retainers is part of the success of my brace treatment"
Teeth stability	"To prevent teeth from moving" "Because teeth can go back" "So my teeth will stay stable" "Retainers will guarantee stability" "Because I don't want my teeth to move" "To prevent relapse"
Healthy dentition	"To keep my teeth healthy" "It will maintain the shape and health of my teeth"



The majority of the patients reported that they were informed about retainers at the start of treatment (72.2%) and only 27.8% were informed about retainers during treatment. Regarding the mean of receiving information on retainers (figure 4), just over half (51.9%) of them were informed about retainers verbally and shown pictures, 28.1% reported they were informed verbally only, and 15.9% were informed verbally and written. Only 4.1% reported that they were informed using videos in addition to verbal instructions. When asked if the

patients have seen any pictures of retainers; 46% were shown pictures of Essex retainers, 7% were shown pictures of bonded retainers and only 3% were shown pictures of a Hawley retainer. No visual aids on retainers were provided to 44% of the patients suggesting they have received verbal instructions and/or written information (figure 5).



DISCUSSION:

A Questionnaire is a very useful tool to investigate patients' perspectives on different treatment approaches and appliances. As there is an increased demand to engage patients in the treatment planning and shared decision-making process, it is important to investigate their level of knowledge and understanding regarding certain appliances such as orthodontic retainers. Whereas, several studies have explored the attitudes of patients and parents towards many orthodontic appliances, not much work has been done on the perspectives of patients on orthodontic retainers. To the best of our knowledge, this is the first study to investigate the knowledge and understanding of Arab patients regarding orthodontic retainers.

Knowledge of orthodontic retainers:

In general, the majority of patients recognize that they will need a set of retainers at the end of treatment. However, reporting details such as, retainer type, length of retention and number of hours revealed suboptimal knowledge. Furthermore, characteristics such as gender, timing of treatment, and level of education had no influence on their level of knowledge. One would expect females to be more meticulous regarding their teeth as women are more demanding of aesthetics than men.^{19,20} In our study, there was no statistical difference in terms of gender. In addition, no significant difference was found between patients whose appliances were fitted less or more than 6 months. On this basis, regardless of the timing of starting treatment and presumably discussing the need for retention as part of the informed consent process, the knowledge of patients regarding retainers did not reduce over time. This in turn supports the current orthodontic practice of discussing retainers at the start of treatment and again towards debond. Similarly, there was no statistical difference in terms of knowledge between the three educational groups.

Understanding of orthodontic retainers:

As far as the patients' understanding goes, a large proportion of the respondents appreciate why retainers are needed. However, as their understanding was investigated further, our results showed there is a great lack of understanding regarding orthodontic retainers. More than a half recognize what will happen if they abandon wearing their retainers, however only 39% of the respondents understand what "orthodontic relapse" means. Again, gender and treatment timing were insignificant factors when it comes to the level of understanding. Nevertheless, the influence of education level on the understanding of orthodontic retainer was statistically significant. University graduates and professionals showed a much deeper

understanding of the importance of retention. These findings are in agreement with previous studies where highly educated patients are more willing to maintain and invest in dental care. This potentially reflects lack of understanding among the younger groups and less educated respondents and it can be postulated that informing patients on retention should be delivered and customised according to the level of each patients' education. It also suggests that adult patients and working professionals pay more attention during treatment discussions and signing the consent as they are paying for the treatment themselves. In contrast, younger patients and secondary school students are unlikely to be paying for the treatment so they show less appreciation towards understanding what their treatment involves.

When asked about the importance of retention and retainers, the majority believed that retainers are very important or important, (45%) and (43%) respectively. Only 12% of the patients reported that wearing orthodontic retainers is not important. This agrees with previous studies investigating adherence and compliance with retainer wear. Around one third of the patients responded they are aware they will require both types of retainers (removable and fixed), however, only half of them understand why. This signifies that patients do acknowledge the importance of wearing retainers yet fail to express the reason why retainers are important. This could be attributed to the method of explaining retention and means of information provision.

Communication and information provision:

In order to reliably assess the level of knowledge and understanding of patients, it is important to assess how and what information has been provided to the patients. The majority of the respondents were informed about retainers at the start of treatment (72.2%) and nearly one third were informed during treatment (27.8%). When asked about the means of receiving information about retainers; only half of the patients reported they were informed verbally and shown pictures or videos of retainers. The majority were shown pictures of Essex (73%) or bonded retainers (40%). Previous studies on retainer compliance have found that using pictures in addition to verbal instructions increased the amount of wear and compliance with removable retainers.²¹ Moreover, in terms of patient preference, studies have shown that orthodontic patients prefer visual aids rather than verbal instruction alone to improve their understanding of orthodontic retainers.¹³ On this basis, it should be recognized that using visual aids to explain the importance of retention could have improved the understanding of patients on the importance of retention.

Limitations of the study:

This study had some limitations: 1. The respondents were all recruited from private practices in the city of Benghazi. Due to certain COVID restrictions at the time of the study, it was not possible to include orthodontic patients from public centres. As a result, the findings of this study cannot be generalised to the entire orthodontic population and can only be interpreted within the context of private practice. 2. The knowledge of patients regarding orthodontic retainers before starting treatment was not assessed. This would have allowed the authors to evaluate whether previous background information from friends, family, internet and social media had an influence on the patient's current knowledge and understanding of retention. 3. The questionnaire did not ask the respondents about their preferred method of receiving instructions and information on retention. This information would have been useful to help reform practice policies and guidelines on retention.

CONCLUSIONS AND RECOMMENDATION:

This study has provided valuable insight on the knowledge and understanding of orthodontic retainers among Libyan patients undergoing orthodontic treatment. There is a clear lack of understanding regarding the importance of retention, suggesting improving the means we deliver information to our patients. Furthermore, taking the educational and professional level of patients into consideration and customising the way information is disseminated to patients would help improve their understanding of treatment and hence their compliance with wearing their retainers.

Conflict of interest:

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Financial support:

None.

REFERENCES:

- Melrose C, Millett DT. Toward a perspective on orthodontic retention? *Am J Orthod Dentofacial Orthop.* 1998;113(5).
- Little RM, Riedel RA, Artun J. An evaluation of changes in mandibular anterior alignment from 10 to 20 years postretention. *Am J Orthod Dentofac Orthop.* 1988;93(5).
- Littlewood SJ, Millett DT, Doubleday B, Bearn DR, Worthington H V. Retention procedures for stabilising tooth position after treatment with orthodontic braces. Vol. 2016, *Cochrane Database of Systematic Reviews.* 2016.
- Hua, F. (2019). Increasing the value of orthodontic research through the use of dental patient-reported outcomes. *J Evid Based Dent Pract* 2019.19(2), 99-105.
- Ellis, P. E., & Benson, P. E. (2002). Potential hazards of orthodontic treatment-what your patient should know. *Dental update*, 29(10), 492-496
- Friedlander, A. H., Rosenbluth, S. C., Freymiller, E. G., & Braddock, C. H. (2015). When clinical evidence is conflicted, who decides how to proceed?: An opportunity for shared decision making. *J Am Dent Assoc* 2015, 146(10), 713-714..
- Taft RM, David PR, Jugan MJ. Use of a thermoplastic retainer as an interim prosthesis for implant therapy: a case report. *Hawaii Dent J.* 2002;33(6).
- Perry J, Popat H, Johnson I, Farnell D, Morgan MZ. Professional consensus on orthodontic risks: What orthodontists should tell their patients. *Am J Orthod Dentofac Orthop.* 2021;159(1).
- Tsichlaki A, Chin SY, Pandis N, Fleming PS. How long does treatment with fixed orthodontic appliances last? A systematic review. *Am J Orthod Dentofac Orthop.* 2016 Mar 1;149(3):308-18.
- Lefer L, Pleasure MA, Rosenthal L. A psychiatric approach to the denture patient. *J Psychosom Res.* 1962;6(3).
- Nanda RS, Kierl MJ. Prediction of cooperation in orthodontic treatment. *Am J Orthod Dentofac Orthop.* 1992;102(1).
- Thomson AM, Cunningham SJ, Hunt NP. A comparison of information retention at an initial orthodontic consultation. *Eur J Orthod.* 2001;23(2).
- Al-Moghrabi D, Colonio Salazar FB, Johal A, Fleming PS. Factors influencing adherence to vacuum-formed retainer wear: A qualitative study. *J Orthod.* 2019;46(3).
- Mollov ND, Lindauer SJ, Best AM, Shroff B, Tufekci E. Patient attitudes toward retention and perceptions of treatment success. *Angle Orthod.* 2010;80(4).
- Survey Sampling. By Leslie Kish. (New York: John Wiley & Sons, Inc., 1965. Pp. xvi, 643. \$10.95.). *Am Polit Sci Rev.* 1965;59(4).
- Rattray J, Jones MC. Essential elements of questionnaire design and development. *J Clin Nurs.* 2007 Feb;16(2):234-43.
- Tsang S, Royse CF, Terkawi AS. Guidelines for developing, translating, and validating a questionnaire in perioperative and pain medicine. *Saudi J Anaesth.* 2017 May;11(Suppl 1):S80.

18. Lasance SJ, Papageorgiou SN, Eliades T, Patcas R. Post-orthodontic retention: How much do people deciding on a future orthodontic treatment know and what do they expect? A questionnaire-based survey. *Eur J Orthod.* 2020;42(1).
19. Mamai-Homata E, Koletsi-Kounari H, Margaritis V. Gender differences in oral health status and behavior of Greek dental students: A meta-analysis of 1981, 2000, and 2010 data. *J Int Soc Prev Community Dent.* 2016;6(1).
20. Ellakany P, Fouda SM, Alghamdi M, Bakhurji E. Factors affecting dental self-confidence and satisfaction with dental appearance among adolescents in Saudi Arabia: a cross sectional study. *BMC Oral Health.* 2021;21(1).
21. Lin F, Sun H, Ni Z, Zheng M, Yao L. A feasible method to improve adherence of Hawley retainer in adolescent orthodontic patients: A randomized controlled trial. *Patient Prefer Adherence.* 2015;9:1525.