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Original Research Article

Oral Hygiene Performance among a Sample of Sudanese Orthodontic Patients

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Background: Proper oral hygiene performance is a prerequisite to prevent complications from increased food debris and plaque retention during the treatment period with fixed orthodontic appliance.
Objective: To assess oral hygiene performance of Sudanese patients with fixed orthodontic appliance.
Materials and Methods: A descriptive cross-sectional study of 500 orthodontic patients. Data collected through personal interview, using a well-structured questionnaire regarding oral hygiene maintainer during the fixed orthodontic treatment.
Results: Half of the sample brushes their teeth twice a day. 46% maintained oral hygiene using a toothbrush and Interdental cleaning-aids. 73% brushes their teeth both vertically and horizontally and 44% used Interdental cleaning-aids daily. 51% preferred the use of Interdental brushes. 38% of the patients attended orthodontic clinics regularly for a check-up and professional cleaning. Most of the patients (81%) taught by their orthodontist to maintain a proper oral hygiene, (61%) were instructed to use fluoridated toothpaste or mouthwash and (79%) of the patients were reported to follow the orthodontist's instructions for maintaining proper oral hygiene during treatment.
Conclusion: Acceptable oral hygiene maintenance reported in Sudanese patients with fixed orthodontic appliance.
Recommendation: Great emphasis should be considered to improve the awareness and knowledge of disadvantage of improper oral hygiene maintenance during treatment with fixed orthodontic appliance.

Key words: Sudanese patients, Oral Hygiene, Toothbrush, Inter dental aids, fixed orthodontic appliances.

INTRODUCTION

It is well known that good oral hygiene is the practice of keeping both the intra-oral soft tissues and teeth clean to prevent dental problems, most commonly, dental caries, gingivitis, and halitosis. As well as oral pathologic conditions in which good oral hygiene is required for healing and regeneration of the oral tissues. These conditions included gingivitis, periodontitis, and dental trauma.

Orthodontics is an art and a science necessitates collaboration between the orthodontist, hygienist, patient and other specialists related to skeletal and facial correction. One of the impasses that may accompany orthodontic treatment is the patient's negligence in oral hygiene jeopardizing the treatment or even worsening the previously compromised dental situation; dental caries, periodontitis, gingival recession, pigmentation, stains and compromised aesthetic appearance. [1]

Plaque build-up during orthodontic treatment may lead to chronic hyper plastic gingivitis, increased pocket depths and slight, but significant loss of periodontal support. The orthodontist has a double obligation; advise the patient about methods of plaque control during treatment, at routine visits, and to monitor the effectiveness of the oral hygiene regime. Three main methods of patient instruction are commonly used; verbal, printed materials, and videotapes. However, despite receiving appropriate advice, many patients who undergo orthodontic treatment fail to maintain an adequate standard of plaque control. [2]

The oral cavity is a complex ecosystem inhabited by more than 300 bacterial species that include; mycoplasmas, protozoa, and yeasts. [3] Any external interference could disturb the delicate balance between components of micro-flora in the environment of the oral cavity. Fixed orthodontic appliances are an example of such interference. Bonding of the brackets with acid etching of enamel, consequences changes in the morphology and the chemical nature of the oral cavity will occurs. Decalcified enamel constitutes good support for adhesion and proliferation of Streptococcus mutans, Veillonella spp., and Actinomyces viscosus. [4]

It is also known that living cells easily adhere and colonize polymeric surfaces. Thus, composite resins containing

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polymers used for attaching the brackets to etched enamel provide surfaces, especially prone to adhesion and growth of microorganisms.[5,6] Moreover, the configuration of fixed appliances promotes retention of food and reduces the efficiency of self-cleaning by saliva.[7]

Plaque may lead to gingival irritation (gingivitis), which become red, tender and easy to bleed. In some cases it causes gingival recession leaving cavities inhabited by bacteria and pus. If not control, alveolar bone will occur. Teeth may become loose or have to be removed due to periodontal disease, mostly in adults. Eating a balanced diet and limiting snacks can prevent tooth decay and periodontal disease. [8]

Tooth decay is the most common global disease. Over 80% of cavities occur inside pits and fissures on chewing surfaces where brushing cannot reach food left trapped after every meal or snack, and saliva or fluoride has no access to neutralize acid and remineralize demineralized teeth, unlike easy-to-reach surfaces, where fewer cavities occur.[9]

Malocclusion is an inaccurate relationship between the maxilla and the mandible, or a general misalignment of the teeth. Malignment teeth are thought to be of genetic origin combined with poor oral habits, or other factors in the early years. An Individual with malocclusion have more difficulty in cleaning and maintain good oral hygiene .[10]

Orthodontic treatment is requisite for alignment of mal position teeth, teeth are moved either by fixed or removable appliances. In case of fixed appliance, brackets are adhered to the tooth surface, the greater the area of the tooth covered by a bracket, the greater the complexity of other appliance components and it becomes difficult for the patient to maintain the teeth clean properly.[1]

Personal hygiene care; proper brushing and flossing daily, minimize any etiologic agents of disease in the oral cavity. The primary focus of brushing and flossing is to remove and prevent the formation of plaque. Toothbrushes remove plaque on accessible surfaces, but not between teeth or inside pits and fissures on chewing surfaces. Dental floss removes plaque from areas that could otherwise develop proximal caries. Addition hygiene aids, interdentally brushes, water picks, and mouthwashes. [11]

Orthodontics is that branch of dentistry concerned with prevention, interception and correction of malocclusion and other abnormalities of the dento-facial region. Normal alignment of teeth not only contributes to the oral health, but also goes a line with overall well-being and personality of an individual. Correct tooth position is a significant feature for esthetics, function and for overall preservation or restoration of dental health. [12]

In spite of the reward of orthodontic treatment there is some adverse squealer of malocclusion; Poor facial appearance, Risk of caries, Predisposition to periodontal diseases, Risk in the function of the stomato-gnathic system such as improper deglutition, defects in speech, improper respiration, Tempro-mandibular joint problems such as pain and dysfunction are caused by malocclusions associated with occlusal prematurity and deep bite. [13-15]

Oral hygiene instructions and patient motivation is essential in all cases of orthodontic treatment. Having good oral hygiene is important as we get to use the oral cavity for most of our days; all people like to have a clean white set of teeth and fresh breath. It is, therefore, essential that oral hygiene instructions and a hygiene maintenance program are performed during orthodontic treatment. [16]

Proper oral hygiene maintains prevent the build-up of plaque, the sticky film of bacteria and food that forms on the teeth. Plaque adheres to the crevices and fissures of the teeth and generates acids that, when not removed on a regular basis, slowly eat away, or decay, the protective enamel surface of the teeth, causing cavities to form. Plaque also irritates the gingival and can lead to periodontal disease and tooth loss. [17]

Severe enamel staining as a consequence of fixed appliance treatment. Mild decalcification and white spot lesions are not uncommon findings following removal of orthodontic bands and brackets in previously healthy, unmarked teeth.[18]

Oral hygiene can be maintained by a number of ways:

Brushing should be performed with a toothbrush and fluoride toothpaste at least twice a day and preferably after every meal and snack. Effective brushing must clean all the tooth surfaces, Toothbrushes should be discarded every three months due to its in effectiveness. An interdental brush or inter proximal brush, for cleaning between teeth and between the wire of dental braces and the teeth. [19]

Dental floss, preference as inter-dental cleaning aids to avoid inter proximal caries and gingival disease.[20] The medicated liquid should be used for cleaning the oral cavity and treating mucous membranes of the mouth.[21] In addition fluoride application should be emphasized for orthodontic patients it is strengthens teeth enamel, either in tooth paste or special rinses,[22] regular check-ups are a prerequisite for helping the dentist to keep progress of the overall oral health of the orthodontic patient.[23]

The improper oral hygiene maintenance during orthodontic treatment may lead to dissatisfaction of the patients either from staining of teeth or dental caries after removal of the orthodontic appliance.

To our knowledge, no data were available on the oral hygiene performance among orthodontic patients in Sudan. Therefore, the researchers were encouraged to carry out this study to give a global idea about oral hygiene performance among a sample of Sudanese orthodontic patients.

Materials and Methods

The present study was carried out after achieving the ethical approval from the University of Medical Science and Technology research committee. In addition, approval was obtained from the head of the orthodontic department in the Khartoum Teaching dental Hospital and University of Khartoum, Faculty of Dentistry. In each of the selected institutes, participants were shown the objective of the research and they were requested to participate voluntarily. The data was kept confidential.

A descriptive cross-sectional study carried out for orthodontic patients in the two clinics, Khartoum Teaching Dental Hospital; located in the center of Khartoum state, one of the largest dental hospitals, which receive a large number of orthodontic patients per day and University of Khartoum, Faculty of Dentistry, orthodontic clinic; the barely university offer fixed appliance treatment in Sudan. The inclusion criteria for data selection were patients with fixed orthodontic appliance for more than six months. Whereas, patients under treatment with fixed orthodontic appliance less than six months or with removable appliances were excluded.

Sampling technique used was non-probability convenience sampling method, where the easiest members of the target population were selected. The sample size depended on the case findings, which was found to be 500 during the study period (November 2012 to February 2013).

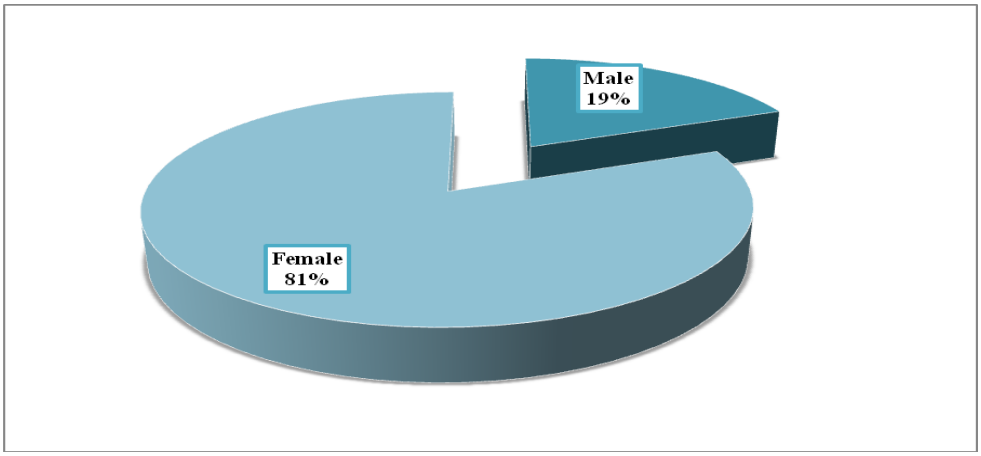


Figure 1: Distribution of the study sample according to gender

The majority of the study sample, 225 patients (45%) fell in the age group 20-24 years old. However, only 45 patients (9%) were in the age group 10-14 years figure (2).

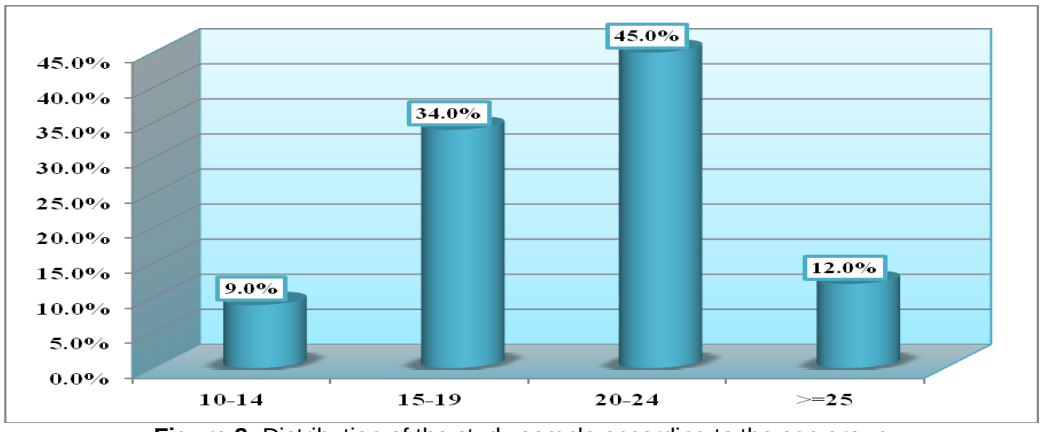


Figure 2: Distribution of the study sample according to the age group

Figure 3 showed that the education level of majority of the study sample 415 patients (83%) had university level education, whereas none of the patients were illiterate.

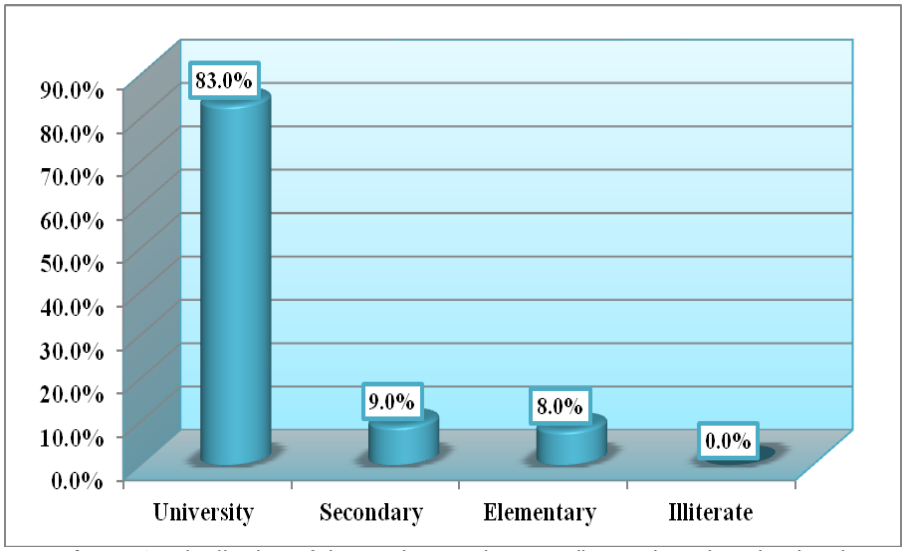


Figure 3: Distribution of the study sample according to the education level

In the way or ways of maintaining the oral hygiene it was found that 230 patients (46%) use the toothbrush and interdental cleaning-aids (dental floss, dental wood stick and inter-dental brushes), whereas in using the toothbrush alone and toothbrush with mouthwash, it was equal 135 (27%) among the patients figure (4).

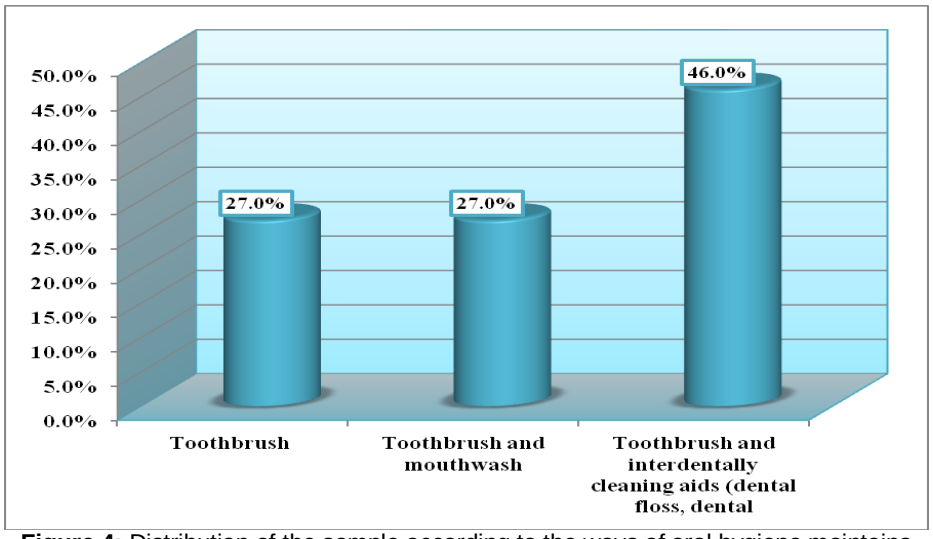


Figure 4: Distribution of the sample according to the ways of oral hygiene maintains

According to the frequency of brushing the teeth per day, 285 patients (57%) brush their teeth twice a day, whereas only 70 patients (14%) brush only once a day table (1).

Table 1: Distribution of the sample according to Frequency of brushing the teeth

Frequency of brushing the teeth per day	Frequency	Percent
Once a day	70	14.0%
Twice a day	285	57.0%
Three times or more per day	145	29.0%
Total	500	100.0%

The majority of the study sample 365 patients (73%) brush their teeth in a horizontal and vertical direction, whereas only 60 patients (12%) brush their teeth in a vertical direction Table (2).

Table 2: Distribution of the sample according to the way of brushing

Way of brushing	Frequency	Percent
Vertical	60	12.0%
Horizontal	75	15.0%
Both	365	73.0%
Total	100	100.0%

In the use of Interdental cleaning-aids (dental floss, dental wood stick and inter-dental brushes), 220 patients (44%) use Interdental cleaning-aids daily, whereas 45 patients (9%) never use cleaning-aids Figure (5).

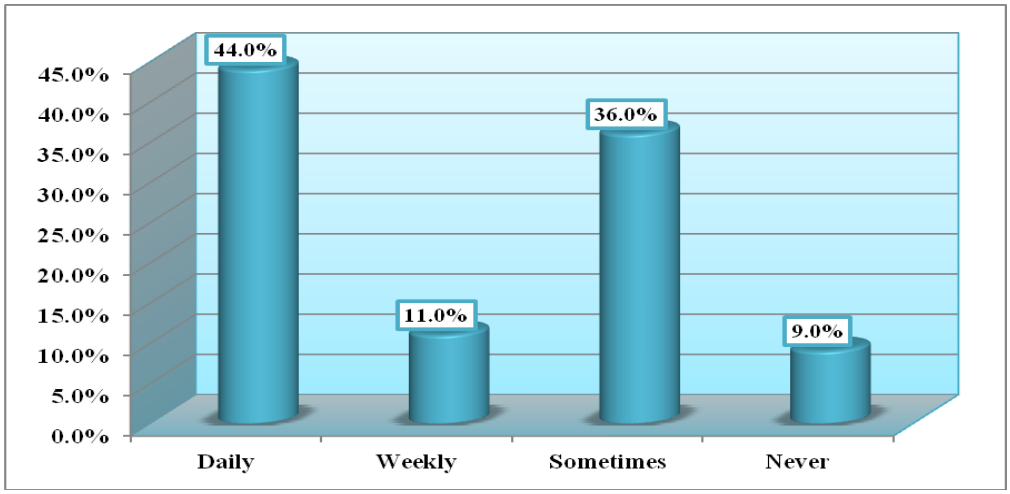


Figure 5: Distribution of the study sample according to the frequency of using interdental cleaning-aids (Dental floss, dental wood stick and inter-dental brushes)

Figure 6 showed the common type of Interdental cleaning-aid used by the study sample, approximately half of the patients 255 (51%) reported to use Interdental brushes, whereas 60 patients (12%) reported to use the dental floss.

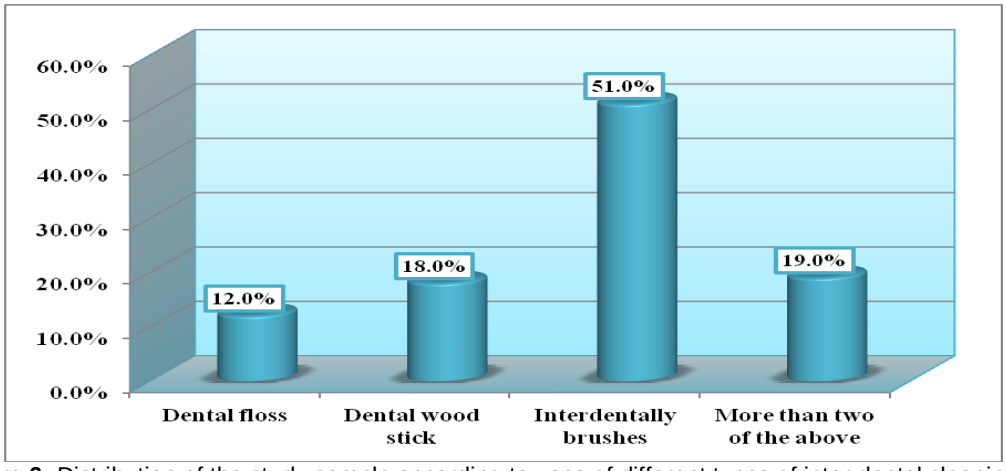


Figure 6: Distribution of the study sample according to uses of different types of inter dental cleaning-aid

The data were collected by visiting the Orthodontic clinics at the University of Khartoum, Faculty of Dentistry and Khartoum Teaching Dental Hospital two times a week during the data collection period. Orthodontic patients who attended the Orthodontic clinic for follow up were interviewed using a well-structured, close-ended questionnaire for the collection of the required data: Level of patient's education, maintains of oral hygiene, frequency of brushing of teeth per day, way of brushing the teeth, uses' and types of inter dental cleaning, in addition to the instruction given by their orthodontist concerning the way of maintaining oral hygiene.

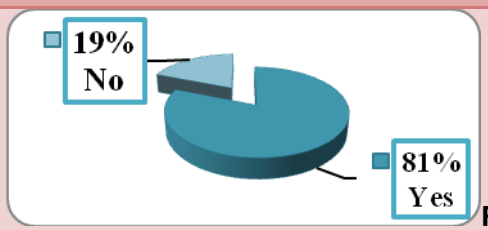
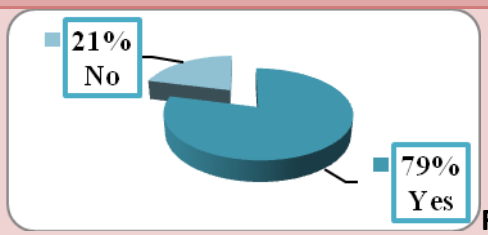
Data processing and analysis

Data was cleaned and organized; it was tabulated and analyzed using the Statistical Package for Social Sciences (SPSS) program version 17.0. Descriptive analysis was undertaken generating tables and graphs of all variables.

Results

The total number of the orthodontic patients in the present study was found to be 500 patients. It was noticed that 405 patients (81%) were females and 95 were males. Male to female ratio was reported to be 1:4. Accordingly gender dimorphism was not conducted due to the great differences between the two genders as shown in figure (1).

Table 3: together with figures 7, 8, and 9 showed the answers of the study sample to three dichotomous (yes/no) questions

Answers / Questions	Frequency		Figures
	Yes (%)	No (%)	
Did your orthodontist teach you how to maintain your oral hygiene?	405 (81%)	95 (19%)	 **Figure.7**
Did your orthodontist tell you to use fluoridated toothpaste/mouthwash?	305 (61%)	195 (39%)	 **Figure.8**
Did you follow instructions given to you by your orthodontist?	395 (79%)	105 (21%)	 **Figure.9**

In table 3 it's clear that almost 80% of the respondents gave positive answers (yes) to questions one and three. Whereas is in question two reported by 61% of the sample.

In visiting the orthodontic clinic for a check-up and professional cleaning, 190 patients (38%) reported that they used to have visits every 3 months, whereas 35 patients (7%) visit irregularly and 105 patients (21%) never visit the orthodontic clinic for the purpose of check-up and professional cleaning figure 10.

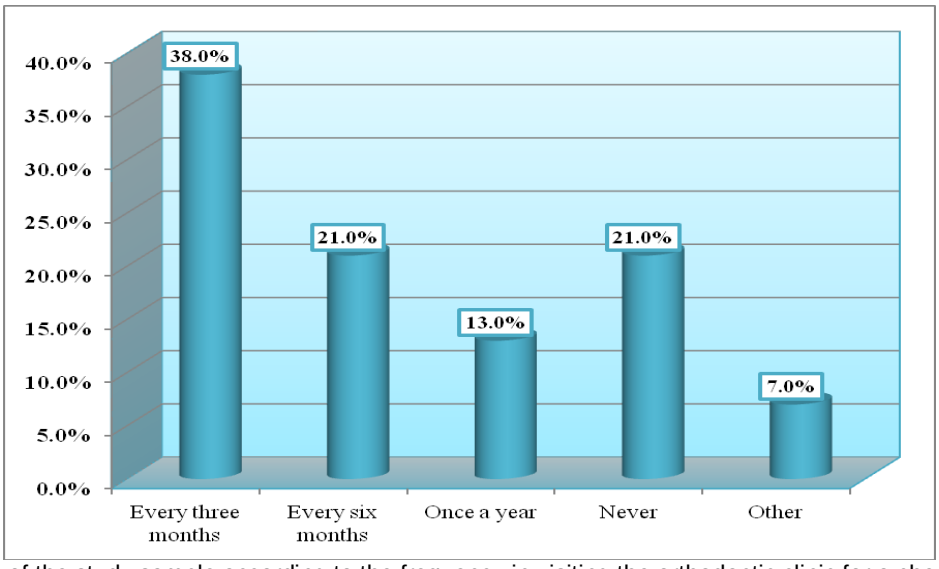


Figure 10: Distribution of the study sample according to the frequency in visiting the orthodontic clinic for a check-up and professional cleaning

Discussion

It is a cold hard fact that inadequate oral hygiene care among orthodontic patients may make them more prone to develop gingivitis during orthodontic treatment. Therefore, it is essential that oral hygiene instructions and maintenance program should be performed during orthodontic treatment. In the current study, the researcher was mainly concerned with the assessment of the oral hygiene performance among 500 Sudanese patients with fixed orthodontic appliance.

This study sample may not reflect the oral hygiene performance in orthodontic patients as the study was conducted only in two government orthodontic clinics. Females outnumber males, constituting 81% of the total number of the study sample. The study showed that 88% of the patients were falling within the age group (10 - < 25) years old, with an average age of 20 years old, which may indicate very young population with some acceptable age homogeneity.

The most familiar methods by almost half of the Sudanese patients for maintaining the oral hygiene were the toothbrush and Interdental cleaning-aids (dental floss, dental wood stick and/or inter-dental brushes). This can be attributed to the high educational level (University level) of a majority of the orthodontic patients together with appropriate instructions had been given by the orthodontists.

In the current study, 86% of the patients were used to brush their teeth twice or more times per day, which is considered to be a good oral hygiene practice among the Sudanese patients. The way those patients brushed their teeth was quite acceptable since 73% of them use both vertical and horizontal brushing methods.

The American Dental Association Survey revealed that 53% of the patients brush their teeth twice a day, 25% more than three times a day and 15% once a day, which are inconsistent with the results obtained in this study, where 57% of the sample brush their teeth twice a day, 29% more than three times a day and 14% once a day. [24] The instructions given by orthodontists for correct performance of good oral hygiene and applied by the patients in the present study sample was recorded to be 81% which is slightly more (74.5%) than the results obtained by Berlin-Broner Y.[25] This difference can partially attributed to the different in the sample sizes, age and educational levels of the sample.

With the use of fluoridated mouthwash during orthodontic treatment, 61% of the patients in the present study were recorded that they have been instructed to use fluoridated mouthwash. Whereas, lesser percentages were reported by Berlin-Broner Y and Aous Dannan, 31.5% and 53% respectively.[25,26] The low percentage achieved in the other studies, might be attributed to the way of oral hygiene instruction given by the orthodontists; brush the teeth once a week with high concentration of fluoride gel as well as receiving application of high concentration of fluoride gel or varnish at the dental office, in contrast to the ways used by the Sudanese patients to use fluoridated mouthwash as much as they can.

In answering the question of attending the orthodontic clinic regularly for a check-up and professional cleaning, Berlin-Broner Y observed that 52% of the patients attended regularly.[25] whereas in the present study it was found to be only 38% of the study sample attended regularly. This difference can be proposed to the insufficient motivation and awareness of the patients by their orthodontists in the present study as well as the insufficient time they have, since most of the study sample are university students whom may occupy a busy schedule.

In Saudi Arabia, Atassi F found that only 32% of the participants reported visiting the orthodontic clinic regularly for check-up and professional cleaning during their orthodontic treatment, which is nearly close to the percentage found in the present study (38%).[27] This shows a poor attendance to the orthodontic clinic by this group of patients, which might be due to the lack of dental awareness.

On the regular use of dental floss during orthodontic treatment only 60 patients (12%) in the present study were found to use it. Also, the same results were obtained by Aous Danna among Syrian orthodontics patients were very few percent (12%) of his sample use the dental floss.[26] This similarity can be due to the close relationship of cultural beliefs and financial status in the two populations in addition to the difficulty of use of the dental floss with the fixed orthodontic appliance.

On the contrary, a greater percentage of patients (51%) using the dental floss daily were reported by the American Dental Association Survey [24]. This high difference may be due to the lack of dental awareness in the present study

sample as well as the variation of the sample sizes in the different studies.

Conclusion

Toothbrush and Interdental cleaning-aids were the most popular practice of maintaining the oral hygiene by the Sudanese patients with fixed orthodontic appliance, the most frequent brushing technique used was vertical and horizontal direction and the inter dental brush were the most preferred inter dental cleaning-aid.

The majority of the study sample brushed their teeth twice a day or more and few attended the orthodontic clinic regularly for a check-up and professional cleaning. The present results illustrate a good performance of oral hygiene by Sudanese orthodontic patients with the drawback of infrequent visits to the orthodontic clinic.

Recommendations

- Apart from what has been achieved from this study, further study is recommended for a larger sample size, equal number of males and females, with different age groups and levels of education as well as governmental and private orthodontic clinic to find out whether gender, age and level of education had influence in the attitude and practice of orthodontic patients towards maintaining proper oral hygiene.
- Immense instructions for maintaining a proper oral hygiene and the consequence of visiting the orthodontic clinic regularly for check-up and professional cleaning throughout the treatment period should be obliged to orthodontic patients.

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