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Gingival Condition of Dental Students with Fixed Orthodontic Appliances

Agus Susanto[a*], Khairunnisa Nibras Ramadhanti[b], Nunung Rusminah[c], Chandra Andi Bawono[d], [a,c,d]Department of Periodontics, Faculty of Dentistry, Padjadjaran University, Indonesia, [b]Dental students faculty of dentistry, Padjadjaran University, Indonesia, Email: [a]agus.susanto@fkg.unpad.ac.id

The use of fixed orthodontic appliances is one of the risk factors that facilitate the accumulation of plaque which can cause inflammation in the gingival area or gingivitis. Students of the Faculty of Dentistry have learned information about how to maintain oral hygiene to avoid various risks of dental and oral diseases, one of which is gingivitis. This study aims to determine the description of gingival conditions in students of the Faculty of Dentistry, Padjadjaran University who wear fixed orthodontic appliances. This study was conducted with a descriptive survey method using cross-sectional design. The subject of this study were 64 Padjadjaran University Faculty of dentistry students who used fixed orthodontic appliances and sampling was done using a total sampling technique. Examination of gingival condition was carried out using a periodontal probe, mouth mirror and examination form, then evaluated with Löe and Silness Gingival Index. 63 students (98.44%) had mild inflammation and 1 student (1.56%) had moderate inflammation. Gingiva condition in Padjadjaran University Faculty of Dentistry students who used fixed orthodontic appliances are in a mild inflammatory state.

Keywords: *Dental Students, Gingiva Condition, Fixed Orthodontic Appliances*

Introduction

The goal of orthodontic treatment is to improve facial aesthetics by improving the position and alignment of teeth, preventing abnormalities of facial shape, and increasing the ability of teeth to function for the better (Ashley et al., 1998). Currently, people prefer to use fixed orthodontic appliances instead of a removable orthodontic appliance to follow a lifestyle without knowing the risks for oral hygiene which can affect the condition of gingiva. The fixed orthodontic appliance design is more difficult to clean than the removable orthodontic appliance making it more difficult for fixed orthodontic users to maintain oral hygiene during treatment. Fixed

orthodontic components, such as brackets and bands, can be a site of plaque accumulation (Ashley et al., 1998; Shekar et al., 2017).

Plaque accumulation can occur if users of fixed orthodontics do not maintain proper oral and dental hygiene. Oral hygiene is an effort made to keep teeth and mouth clean and to prevent dental and oral diseases, such as dental caries, gingivitis, and bad breath (Sim et al., 2017). Oral hygiene is also important to increase the resistance of teeth and periodontal tissues to pathogenic microorganisms. Oral hygiene can be maintained by brushing teeth and cleaning the interdental parts using a toothbrush and dental floss (Kabir & Gul, 2013). In fixed orthodontic users who do not maintain oral hygiene, plaque accumulation will form where there is an interaction between plaque bacteria and tissue which will cause gingival inflammation (Owino et al., 2011). The use of fixed orthodontics also can cause other periodontal diseases, such as periodontitis, gingival recession, and gingival enlargement (Shekar et al., 2017).

Research on the gingival health status of fixed orthodontic appliance users was conducted previously by Anggraini who stated that most respondents experienced mild gingivitis and gingival enlargement (Anggraeni et al., 2011). Another research study was conducted on students of the Medical School of Udayana University and based on this study, it was found that the results of gingival health status were more of the healthy criteria and less on the criteria for mild inflammation (Diah, 2019).

In this study, Padjadjaran University Faculty of Dentistry students were selected as the research sample because they already knew how to maintain oral hygiene to avoid various dental and oral diseases (Maharani et al., 2018). Based on the description above, the researcher is interested in knowing the gingival condition in students of the Padjadjaran University Faculty of Dentistry students who wear fixed orthodontics.

Material and Methods

The research method used is a descriptive study with a cross-sectional design, with a total sample of 63 dental students who wear fixed orthodontics. This research was conducted at the campus of the Faculty of Dentistry, Padjadjaran University, West Java in January - February 2020. The research protocol was approved by the research ethics committee of Padjadjaran University (No: 17 / UN6.KEP / EC / 2020).

The sampling technique was carried out by using a total sampling technique. The description of the gingival condition was evaluated using the modified *Löe and Silness* index and assessment criteria with the selection of teeth based on *Greene and Vermillion* (Benamghar et al.,1982). Then the condition of the gingiva was examined using a periodontal probe and mouth mirror. The periodontal probe traced along the gingival groove on the buccal, lingual, mesial, and distal surfaces of teeth 16, 11, 26, 36, 31, and 46 (Hazen, 1974). The mean score was calculated and interpreted to determine the criteria for gingival conditions as per Table 1.

The data was collected, processed and presented in the form of frequency tables which are divided into several distributions that are: gingival index frequency of the whole sample, gingival conditions and the mean gingival index sample by batch, gingival conditions and the mean gingival index of the samples based on the length of time using fixed orthodontic appliances.

Table 1. Gingival index assessment criteria

Score	Criteria
0	Normal gingiva, no bleeding, no inflammation
1	Slight changes in colour, slight oedema, no bleeding on probing
2	Redness, oedema and glazing, bleeding on probing,
3	Marked redness and oedema, bleed spontaneously

Results and Discussion

The results of the study were from questionnaire data, the gingival condition was measured using the *Löe and Silness* gingival index, and the mean indexes are presented in Table 2, Table 3, Table 4, and Table 5.

Table 2. Questionnaire result data

Questionnaire Data	Total	Percentage
Frequency Control		
Every 1 Month	47	73.43%
Every 2 Month	10	15.62%
Every 3 Month	5	7.82%
Other	2	3.13%
Tooth Brushing Frequency		
Once A Day	0	0.00%
Twice A Day	55	85.94%
Three Times A Day	9	14.06%
More Than Three Times A Day	0	0.00%
Time of Brushing Teeth		
After Eating And Before Sleep	20	31.25%
When Taking A Shower And Before Sleep	41	64.06%
When Taking A Shower And Before Eating	0	0.00%

When Taking A Shower, After Eating, And Before Sleep	4	6.25%
Brushing Technique		
Roll	26	40.63%
Up And Down	6	9.38%
Back And Forth	2	31.3%
Combination	30	46.88%
Toothbrush Type		
Manual Toothbrush	41	64.06%
Orthodontic Toothbrush	18	28.13%
Electric Toothbrush	0	0.00%
Manual Toothbrush dan And Orthodontic Toothbrush	6	9.38%
The Hardness of Toothbrush Bristle		
Soft	48	75.00%
Medium	9	14.06%
Hard	0	0.00%
Alternate	7	10.94%
Oral Hygiene Aids		
Dental Floss	15	23.44%
Tongue Cleaners	9	14.06%
Toothpick	12	18.75%
Interdental Brush	20	31.25%
None	8	12.50%
Brush The Teeth After Every Meal	8	12.50%
Didn't Brush The Teeth After Every Meal	56	87.50%

Table 3. Gingival index frequency of the whole sample

Gingival Index	Interpretation	N	%	Index Mean
0	Normal	0	0,00%	0
0.1-1.0	Mild Inflammation	63	98.44%	0.54
1.1-2.0	Moderate Inflammation	1	1.56%	1
2.1-3.0	Severe Inflammation	0	0.00%	0
Total		64	100%	1.54

Table 4. Gingival conditions and the mean gingival index sample by batch

Gingival Condition		Batch				Total
		2016	2017	2018	2019	
Normal	N	0	0	0	0	0
	%	0.00%	0.00%	0.00%	0.00%	0.00%
Mild Inflammation	N	16	11	25	11	63
	%	25%	17.19%	39.06%	17.19%	98.44%
Moderate Inflammation	N	0	0	1	0	1
	%	0.00%	0.00%	1.56%	0.00%	1.56%
Severe Inflammation	N	0	0	0	0	0
	%	0.00%	0.00%	0.00%	0.00%	0.00%
Mean		0.41	0.49	0.60	0.91	

Table 5. Gingival conditions and the mean gingival index of the samples based on the length of time using fixed orthodontic appliances

Gingival Condition		Length of Time Using Fixed Orthodontic Appliances			Total
		< 6 Months	6 Months – 1 Year	> 1 Year	
Normal	N	0	0	0	0
	%	0.00%	0.00%	0.00%	0.00%
Mild Inflammation	N	1	14	48	63
	%	1.56%	21.88%	75.00%	98.44%
Moderate Inflammation	N	0	1	0	1
	%	0.00%	1.56%	0.00%	1.56%
Severe Inflammation	N	0	0	0	0
	%	0.00%	0.00%	0.00%	0.00%
Mean		0.29	0.66	0.52	

The results showed that most of the students, that is 98.44% or 63 out of 64 students, had mild inflammation and 1.56%, or 1 other student, had moderate inflammation. This condition is likely influenced by the knowledge gained by students in dental education so that most students only experience mild inflammation. The results of this study are similar to those of Ahmad et al (2018) in Saudi Arabia which showed that out of 296 dental students who were examined, there were 74 students who had an average gingival index with mild inflammation criteria and 222 other students had an average gingival index with moderate inflammation criteria. This can also be caused by the accumulation of plaque that occurs due to the use of fixed orthodontic appliances, causing inflammation of the gingiva (Newman et al., 2011).

The results of the gingival index score according to the number of batches show that batch 2019, which includes the college students in freshmen year, has the highest average gingival index score compared to other batches with a value of 0.91. Meanwhile, batch 2018 has a lower average gingival index score compared to batch 2019 with a value of 0.60. Batch 2017, which includes the third-year college students, has an average gingival index score with a value of 0.49. Lastly, batch 2016, which includes the final year college students, has the lowest average gingival index score with a value of 0.41. The results of this study are similar to the research conducted by Cavaillon et al. (1982) at the Paris University Dental School with the results showing that the average gingival index score of dental students was lower in the last year of education, namely 1.40 where the average gingival index score is 1.63. The results show that student behaviour is influenced by the knowledge gained in dental education and can change student habits.

H.L. Blum stated that factors that can affect health status consist of four factors, namely environment, behaviour, health services, and heredity factors. One of the environmental factors that plays a role in health status is education. A person's health status will improve if that person can understand knowledge that has been obtained and apply it in everyday life. This will affect their behaviour so that their health status will increase (Albert & Davia 2011; VanLeeuwen et al., 1999). The application of knowledge obtained by students in daily life will affect oral hygiene and gingival health so that gingival health will improve along with the knowledge gained by students in dental education. The more knowledge and information the student gets, the better his gingivitis will be. The results also showed differences in the average gingival index score based on the length of fixed orthodontic treatment. Students who used fixed orthodontic treatments for 6 months to 1 year had an average gingival index score with a value of 0.66, while students who used fixed orthodontic for more than 1 year had an average gingival index score with a value of 0.52.

The results of this study are similar to the results of a study conducted by Dashari et al. (2014) at the Ibnu Sina Dental Clinic in Yogyakarta with the results showing that patients who have recently undergone fixed orthodontic treatment mostly have moderate oral hygiene status while patients who have had a long period of treatment fixed orthodontics mostly had better hygiene status. These results indicate that the length of time using a fixed orthodontic appliance affects the oral hygiene and gingival condition of the students. Students who have been using fixed orthodontics for a long time are accustomed to maintaining the cleanliness of their teeth and mouth so that the gingival condition is better than those who have just used fixed orthodontics.

The results of the questionnaire show that the majority of students carry out routine controls once a month. Other data from the results of the questionnaire (Table 2) show that the majority of students already know and apply knowledge of dental and oral hygiene in everyday life which can affect the condition of the gingiva. During fixed orthodontic appliance therapy, patient knowledge, knowledge, motivation, cooperation are key factors of oral hygiene maintenance (Kadu et al, 2015). Poor oral hygiene maintenance may be due to a lack of knowledge or negligence of the patient himself (Elanchezhiyan, 2010). Improvement of oral adherence and hygiene effectiveness during orthodontics can be achieved through professional instruction and monitoring (Arici et al., 2007). Prior to commencing orthodontic treatment, the patient should be instructed on the importance of maintaining regular oral hygiene. It is necessary to show the patient the correct technique and frequency of brushing, the patient needs to learn the proper method of tooth brushing, the use of interdental and orthodontic brushes, as well as additional aids for oral hygiene (Matić et al, 2011).

Conclusion

Based on the research that has been done, it was found that the gingival condition of Padjadjaran University Faculty of Dentistry student who used a fixed orthodontic appliance had mild inflammation.

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