

The duration of using denture againsts plaque formation of denture base

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ABSTRACT The assessment of denture plaque can provide valuable information regarding the status of denture hygiene. Denture hygiene is strongly influenced by the patient's socioeconomic condition and the duration of denture use. The commonly used material is the heat cure acrylic resin, which can naturally increase the surface roughness if used for a long time. To determine the differences in the formation of plaque in the denture intaglio in denture use duration. As many as 14 (fourteen) respondents as research subjects used the heat-cured acrylic resin denture and came to one of the Primary clinics in Banda Aceh between April-May 2020 (During the COVID-19 Pandemic). These subjects were divided into three groups, namely <1 year, 1-3 years, and ≥ three years. In this study, the assessment of denture plaque score was conducted by the visual plaque assessment method. The colored area was the intaglio denture area, which was left for 5 minutes. The images obtained were converted into the Tarbet index (Score 1-4). The study showed that each group's denture plaque scores had different denture plaque scores. The highest denture plaque scores were found in dentures used 1-3 years. Compared to <1 year and >3 years of use. The duration of use can affect the formation of denture plaque.

KEYWORDS: denture, plaque, duration of use, intaglio, heat-cured acrylic resin

INTRODUCTION

Tooth loss is a common problem in Indonesian society that cannot be avoided, primarily due to the age factor where there is a decrease in organ function in general and the stomatognathic system. Riset Kesehatan Dasar (RISKESDAS) in 2013 showed the number of tooth loss in Indonesia, which starts at the age of 35-44 years (0.4%) and increases at the age of 65 years and over (17.6%).¹ The increasing number of tooth loss cases will impact an individual's oral and dental health, including functional abilities such as chew and speaking. Psychologically, tooth loss will affect their appearance to interfere with their quality of life.²⁻⁴

So far, people who have lost their teeth, especially anterior teeth related to aesthetics, will replace their teeth using artificial teeth. There are various dentures, but the most commonly used is a removable denture made of acrylic resin. The use of dentures has several advantages, such as easy and fast manufacturing processes and affordable prices.

These dentures also have good aesthetic value and can restore chewing function.

However, if used for a long time, this denture can cause dimensional changes that will affect the denture surface's appearance. Ningsih (2014) and Arafa (2016) showed that the duration of using heat-cured acrylic dentures could cause dimensional changes. This dimensional change also triggered by the increase of surface roughness, as Koroglu (2016) research stated a shift in denture surface roughness after 90 days of use.⁷ Quassem's (2018) study stated that there was an increase in solubility and release of monomers during 1 day, 7 days, 2 weeks, and one month of use.⁸

An increase in surface roughness will lead to more excellent adhesion of bacteria.⁹ The more outstanding adhesion is due to an irregular and porous surface so that plaque (food debris etc.) will stick easily and trigger bacterial colonies' growth, which continues to increase. Nair's research (2016) showed the effect of the duration of using dentures

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with denser/more bacterial colonies found on dentures.¹⁰ These dense colonies will form biofilms that will continue to grow and develop into denture plaque. Denture plaque will be exacerbated due to a lack of knowledge in cleaning the dentures. Ogunrinhe's research (2015) showed many denture wearers who did not understand how to brush good dentures to allow food deposits to occur and forms a plaque on the denture (denture plaque).^{9,11-15}

The amount of denture plaque formation can be measured by several methods. One of them is by

visual. The dentures were exposed to a colored solution and the stained denture plaque area. Many scoring methods have been determined in several studies. One of them is the Tarbet index, where this index measures the plaque area by using a score of 0-4 to describe denture hygiene.^{16,17} Based on this background, we want to know the denture hygiene measured by denture plaque index and its relation with the duration of heat-cured acrylic removable denture use toward denture plaque formation.

MATERIALS AND METHODS

Research Design

This study was a clinical study using denture samples from patients who came to a private clinic in Banda Aceh. Samples were selected by using the accidental total sampling method over two weeks (1st March-17th March 2020). The number of denture patients who came during this period was 21 patients. However, only 14 patients were willing to be the study sample. This sample was divided into three groups, namely patients who had used dentures for less than one year (<1 year), one to three years (1-3 years), and more than three years (> 3 years). Patients who were willing to join, then given an online questionnaire containing their identities, and their denture plaque scores were measured.

RESULTS

This study was a clinical study in which the subject is a patient who came to a private clinic in Banda Aceh before implementing Work From Home during the COVID-19 pandemic. The majority of

Denture Plaque Score Measurement

The dentures were removed from the oral cavity and soaked in a bowl filled with water for 1 minute to remove food debris. Eviplac Solution (Biodinamica®) was smeared all over the intaglio surface by using a brush applicator and left for 1 minute. Next, the intaglio area was washed under running water to remove the unbound dye. The picture that could be seen was then assessed by using the Tarbet index, where a score of 0 indicates there is no plaque. Score 1 mild plaque (25% denture area), score 2 is moderate plaque (26% -50% denture area), Score 3 indicates severe plaque (51-75% denture area), and score 4 is very severe plaque (76-100% of the denture area).¹⁶ Record the score obtained and brush the denture surface by using a brush until clean.

denture patients who were willing to be the sample were women (92.9%) and generally aged > 55 years (35.7%). (Table 1)

Table 1. Sociodemographic State of Denture Patients

Description		Frequency (%)
1. Age		
a. <35 years		2 (14.3)
b. 36-45 years		3 (21.4)
c. 46-55 years		4 (28.6)
d. >55 years		5 (35.7)
2. Gender		
a. Man		1 (7.1)
b. Woman		13 (92.9)
3. Occupation		
a. House Wife		7 (50)
b. College Student		1 (7.1)
c. Retirees		4 (28.7)
d. Government Employee		1 (7.1)
e. Entrepreneur		1 (7.1)

4. Last Education	3 (21.4)
a. Junior High School	4 (28.6)
b. Senior High School	1 (7.1)
c. D3	3 (21.4)
d. D4/Undergraduate	3 (21.4)
e. Postgraduate	
5. Denture Type	9 (64.3)
a. Removable Partial Denture (RPD)	5 (32.7)
b. Removable Full Denture (RFD)	
6. Duration of Use	6 (42.9)
a. < 1 year	4 (28.6)
b. 1-3 years	4 (28.6)
c. >3 years	

Table 1 also showed that the average number of patients were retirees (28.7%) with educational backgrounds ranging from junior high school to postgraduate (S2). These results also showed that 42.9% were patients who used RPD dentures and used them for different periods. The denture plaque score showed different results

depending on the duration of use. The denture plaque score was produced after less than one year (1-2). At the same time, 1-3 years of denture plaque score showed an increase up to a score of 3. However, if used for a more extended period, the denture score became more varied, namely a score of 1-3 (**Table 2**).

Table 2. Effect of duration of use on the denture plaque formation score

Duration of Use	Denture Plaque Score (n(%))					Total
	Score 0	Score 1	Score 2	Score 3	Score 4	
< 1 year	-	3 (75)	3 (75)	-	-	6 (42.9)
1-3 years	-	-	-	4 (66.7)	-	4 (28.6)
> 3 years	-	1 (25)	1 (25)	2 (33.3)	-	4 (28.6)
Total	-	4 (100)	4 (100)	6 (100)	-	14 (100)

Table 3 shown the value of correlation analysis. The chi-square test showed a p-value of 0.042 ($p < 0.05$). This value indicated that there was a significant correlation between the duration of denture use and the denture hygiene score. The test

results also showed that the spearman correlation was $0.195 < 0.5$ (weak correlation) with a positive correlation. This result could be assumed to show that the longer the use of the denture, the higher the denture hygiene score or vice versa

Table 3. The correlation between the duration of denture use and the plaque score

Duration of Use	Denture Hygiene Score (n(%))					p	Correlation
	Score 0	Score 1	Score 2	Score 3	Score 4		
< 1 year	-	3 (75)	3 (75)	-	-		
1-3 years	-	-	-	4 (66.7)	-	0.042*	0.195
> 3 years	-	1 (25)	1 (25)	2 (33.3)	-		

*Chi-Square $p < 0.05$ significant

DISCUSSION

Robusta coffee leaf extract (*Coffea canephora* var. *Robusta*) positively contains alkaloids, saponins, flavonoids, and polyphenols. All of these compounds are active substances that can inhibit the

growth of *S. mutans* bacteria. Alkaloids are known to work by disrupting the peptidoglycan component in bacterial cells. The cell wall layer is unformed entirely and ultimately leads to cell death—the

mechanism of inhibition of saponin compounds by reacting with transmembrane proteins of the bacterial cell wall. Sehen forms a strong polymer bond that damages porins and reduces the permeability of bacterial cell membranes. The reduced permeability of the bacterial cell membrane results in the cell being deficient in nutrients, which causes slow growth of bacteria and even causes death. Flavonoids act by cause an increase in the surface roughness of the denture. This increase will cause the attachment of bacteria to become more. More adhesions could be seen from the stained denture area reaching 25-50% (Tables 2 and 3). Jafari's research (2014) revealed differences in the number of bacteria between patients with dentures and dentures. This study also described the number of bacteria in patients with dentures more than without dentures.²¹

The increase in surface roughness was thought to increase from year to year, especially after 1-3 years of use. This assumption was in line with the rise in the denture plaque score, which increased up to score 3. The increase in this score indicated that the dental plaque had reached 50-75% of the denture area. It occurs due to the lack of patient knowledge about caring for their dentures' hygiene. So in the 1-3 year phase, it was suspected that there was an effect on the patient's age who used dentures. It was suspected that the older the patient was, the less ability to maintain denture hygiene. The increase in plaque scores was also thought to be due to the wrong tooth-cleaning process, such as brushing with a hard bristle toothbrush or cleaning only visible surfaces (especially wearers of RPD). Using the wrong brush would cause scratches on the teeth' surface, so that it became a place for denture plaque development.

The study results showed that denture plaque development had decreased, and some

remained at a score of 3 when used for more than 3 years. This might be due to many things, especially the material and quality of the dentures. Plaque formation in the tooth material causes surface roughness. In PMMA, the monomer has less roughness, so that the possibility of forming denture plaque is very low. The use of dentures in the long term can also change the denture's dimensions, the character of the denture support network, especially RFD, is often loose / moves excessively. The biocompatible material factor is the choice of each user.

These varied results might be suspected because of several factors, including the type of denture used. Most of the subjects used removable partial dentures, which meant that there were still natural teeth left, making it difficult to clean the dentures from food debris stuck to them. Besides, the gender use was more concerned with their dentures' hygiene, mostly if the denture was anterior (loss of anterior teeth) was related to aesthetic factors. Moreover, Silverman's research stated that men accepted the condition of their dentures better than women.²² Women tended to be more likely to look perfect and sensitive to the oddities or discomfort they felt.^{23,24}

There was a positive correlation with a weak correlation between the duration of the denture use and the denture plaque score that was formed (Table 3). This showed that the longer the dentures' use, the higher the denture hygiene score or vice versa. The weak relationship indicated that many factors contribute to the formation of denture plaque. Several factors play a role, such as age, gender, cleaning the teeth, continuous use or not, and the time to immediately place the denture or after a few months from extraction.

CONCLUSION

The duration of denture use can affect the score of plaque formed on the denture. The longer it is used, the higher the denture plaque score is formed. When describing dentures' duration as a

factor for dental plaque forming, many other factors can accompany it, such as age, gender, cleaning the teeth, the patient's physical, etc.

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