# CORRELATION HANDGRIP STRENGTH TO GINGIVAL RECESSION FROM BRUSHING TEETH TRAUMA: PRELIMINARY STUDY

## *(KORELASI KEKUATAN PEGANGAN TANGAN DENGAN RESESI GINGIVA DARI TRAUMA MENYIKAT GIGI: STUDI PENDAHULUAN)*

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## ABSTRACT

Brushing is affected by the strength of hand movements, including the grasping muscles. Excessive brushing of the teeth can result in trauma to the gingiva. This study aims to review the relationship between the strength of the grasping muscles and the occurrence of gingival recession. The cross-sectional research method was conducted at Cirendeu State Elementary School, Cimahi. Handheld muscle strength and gingival recession measurements were performed with a hand dynamometer on an intra-oral clinical examination. The results of the two data will be used in correlation tests to see the relationship using the Pearson Chi-Square Test. The results of the study of twenty children in grade 6 elementary school were weak grip muscle strength of 30% in 6 male students and 20% moderate in 4 students, weak 20% in 4 female students, medium 15% in 3 female students, and strong 15% in 3 female students. There was a gingival recession of 10% each in 2 female and male students. The relationship between the occurrence of recession and muscular grip muscle strength was 33.3% (p-value <0.5). In 12-year-old

children, there was no significant relationship between the strength of the grasping muscles and the occurrence of gingival recession.

**Keywords**: gingival recession; handgrip strength

***ABSTRAK***

*Menyikat gigi dipengaruhi kekuatan pergerakan tangan, termasuk otot menggenggam. Sikat gigi yang berlebihan dapat mengakibatkan trauma pada gingiva. Penelitian ini bertujuan untuk meninjau hubungan antara kekuatan otot genggam terhadap terjadinya resesi gingiva. Metode penelitian cross sectional dilakukan di Sekolah Dasar Negeri Cirendeu, Cimahi. Pengukuran kekuatan otot genggam dilakukan dengan hand dynamometer dan resesi gingiva pada pemeriksaan klinis intra oral. Hasi kedua data akan dilakukan uji korelasi untuk melihat keterkaitannya menggunakan Uji Pearson Chi Square. Hasil penelitian dari dua puluh anak di kelas 6 SD yaitu kekuatan otot genggam lemah 30% pada 6 siswa laki-laki dan 20% sedang pada 4 siswa, lemah 20% pada 4 siswa perempuan, sedang 15% pada 3 siswa perempuan, dan kuat 15% pada 3 siswa perempuan. Terdapat resesi gingiva masing-masing sebesar 10% pada 2 siswa perempuan dan laki-laki. Hubungan antara terjadinya resesi dan kekuatan otot genggam yang kuat sebanyak 33.3% (p value <0.5). Pada anak usia 12 tahun tidak terdapat hubungan signifikan antara kekuatan otot genggam dengan terjadinya resesi gingiva.*

***Kata kunci**: kekuatan otot genggam; resesi gingiva*

## INTRODUCTION

Brushing your teeth is the most common way to clean your teeth and oral cavity. The purpose of brushing is to remove plaque formations that stick to teeth so that their growth does not continue, which can result in caries or periodontal disease.[1]

Basic brushing techniques are divided into Horizontal Scrub, Fones, and Leonard. The horizontal technique has forward and backward movements, the Fones technique has rotary movements, and the Leonard technique has simple movements in the upward and downward directions covering the maxillary and mandible regions.[1,2] Brushing techniques are also influenced by weak and hard hand movement skills when brushing teeth, so it also determines the cleanliness of the oral cavity.[3] In certain conditions, brushing teeth has disadvantages if done excessively, resulting in bad things, including trauma to the gingiva.[4]

Gingival recession can occur from different types of etiology and clinical manifestations. Classic recession can occur when brushing, which is related to muscle strength. This recession is free of inflammation, with a picture of a decrease in the margin to the apical area of the facial area. This recession condition's primary etiology is a morphological and anatomical factor. However, the occurrence of a recession with such a morphology can be triggered due to mistakes in brushing teeth so that trauma occurs, for example, in brushing horizontally with excessive pressure.

The strength of the grip muscles is also very closely related to brushing your teeth. The muscles that work when grasping between are the superficial digitorium flexor muscle and the digitorium profundus flexor muscle. When brushing your teeth with increased force, more plaque will be removed. The recommended brushing force should not exceed 3 N to avoid gingiva recession.[5,6]

However, in certain conditions, brushing with the wrong frequency, duration, and force can damage the hard tissues of the teeth and periodontal tissues. However, research on the relationship between brushing power related to the grip muscle and the occurrence of gingival recession is still rare. Therefore, the author is interested in researching the relationship of the grip muscle to the occurrence of gingival recession.

## METHOD

The research procedure will be divided into two parts. First, to measure the strength of the grasping muscles, an intra-oral examination is carried out to see a gingival recession.

### Muscle Strength Measurement

The implementation of handheld muscle strength measurement began with an explanation of using a hand dynamometer (Camry EH 101) to the respondents. Accessories on the wrist to the

hand are asked to be removed. Respondents will be measured in a standing position with both hands at the sides of the body. Then, in the following position, check the muscle strength in the ready/stance position. The hand used to brush the teeth is tilted forward with the foot on the same side. The dominant hand grip strength was assessed thrice, with each measurement time being 3 seconds. The value of the grasp result for 3 seconds carried out three times in a row was recorded and averaged. The data on the recording of handheld muscle strength values was differentiated by gender. The measurement scale is divided by gender and age. 12-year-old males are divided into strong >31.2 kg, medium 19.4-31.2 kg, and weak <19.4 kilograms. 12-year-old males are divided into strong >24.4 kg, medium 14.6-24.2 kg, and weak <14.6 kilograms.

**Gingiva Recession Measurement**

The gingival recession measured in this study is clinically visible, resulting from tooth brushing trauma—measurements using the UNC 15 probe (Osung, South Korea). The method of measuring recession is by placing the probe parallel to the long axis of the tooth. The probe's tip with the smallest scale is at the top of the gingival margin, which is located most often. The length limit of the depth of the gingival recession is along the peak of the most apical gingival margin up to CEJ (Figure 3.1). The measurement results will be recorded according to the Miller recession scale with small (< 3 mm), medium (3-4 mm), and large (>4 mm) classifications. [14]

The data obtained from the two examinations will be processed by computerization. The frequency distribution table will present data regarding the grasped muscles' strength values and the recession measurement. Then, the data will be processed using the Statistical Product and Service Solution (SPSS), IBM SPSS Statistics 25. Descriptive analysis was carried out to describe the research subjects in the proportion of each variable. Ordinal scale data are presented as averages, percentages, and standard deviations. Both research variables will be followed by a correlation test to review the relationship further, using the Pearson Chi-Square test.[15]

**RESULT**

As a result of the research that has been carried out, data have been obtained regarding the value of the arm muscle and the examination of gingival recession in Grade 6 students of SDN Cirendeu, Cimahi City. At Cirendeu State Elementary School, grade 6 students who were used as the target of the study had a frequency distribution

based on gender, namely 10 students for boys and 10 students for girls. The number of students in grade 6 is 20 children (Table 1).

**Table 1.** Frequency distribution of grade 6 students of SDN Cirendeu by gender

| | | Percentage % | Cumulative percentage |
|---|---|---|---|
| Man | 10 | 50% | 50% |
| Woman | 10 | 50% | 50% |
| Total | 20 | 100% | 100% |

The grip muscles in grade 6 students of SDN Cirendeu are divided into strong, weak, and medium categories. The strength of the grip muscles is grouped according to gender. In 12-year-old males, the strong category is >31.2 kg, medium 19.4-31.2 kg, and weak <19.4 kg. Meanwhile, in 12-year-old females, the strong category is >24.4 kg, medium 14.6-24.2 kg, and weak <14.6 kg.

**Table 2.** Overview of muscle grip strength of Grade 6 students of SDN Cirendeu.

| | N | Mean±SD | 95% CI | |
|---|---|---|---|---|
| | | | Min | Max |
| Man | 10 | 17.52 ± 5.52 | 9.80 | 24.86 |
| Woman | 10 | 20.96 ± 11.32 | 7.76 | 43.20 |
| Avg | 20 | 19.24 ± 8.84 | 7.76 | 43.20 |

The picture of handheld muscle strength (Table 2) in ten male students had an average of 17.52 kg. Meanwhile, ten female students had an average of 20.96 kg.

**Table 3.** Frequency distribution based on the handheld muscle strength category of grade 6 students of SDN Cirendeu.

| | N | Weak | Moderate | Strong | Cumulative percentage |
|---|---|---|---|---|---|
| Man | 10 | 6 (30%) | 4 (20%) | - | 50% |
| Woman | 10 | 4 (20%) | 3 (15%) | 3 (15%) | 50% |
| Total | 20 | | | | 100% |

The measurement results (Table 3) were obtained in males. Four students had muscle strength in the medium category, and six were in the weak category. The male students' grip muscle strength ranged from strong to weak at 9.8 – 24.86 kg (Table 4.2).

The measurement results (Table 3) were obtained in women. Three students had muscle strength in the strong category, 3 in the medium category, and 4 in the weak category. The strength of the grasped muscles ranged from strong to weak at 7.76 – 43.20 kg (Table 2). The data obtained regarding the gingival recession in grade 6 students of SDN Cirendeu is divided into categories of presence and non-existence. The picture of the assessed gingival recession is based on the clinically visible recession. The results obtained were divided based on male and female genders.

**Table 4.** Overview of the recession of grade 6 students of SDN Cirendeu.

| | N | With recession | % | No Recession | % | Cumulative percentage |
|---|---|---|---|---|---|---|
| Man | 10 | 2 | 10% | 8 | 40% | 50% |
| Woman | 10 | 2 | 10% | 8 | 40% | 50% |
| Total | 20 | | | | | 100% |

**Table 5**. The relationship between grip muscle strength and recession in SDN Cirendeu Students

| | | Recession | | Total | *P* value |
|---|---|---|---|---|---|
| | | Yes | No | | |
| Handgrip strength | Weak | 1 (10%) | 9 (90%) | 3 (100%) | 0.527 |
| | Moderate | 2 (28.6%) | 5 (71.4%) | 10 (100%) | |
| | Strong | 1 (33.3%) | 2 (66.7%) | 7 (100%) | |

The clinical examination results (Table 4) in Grade 6 students of SDN Cirendeu by gender showed that in male students, there were two people who experienced gingival recession (10%). Meanwhile, in female students, two people experience gingival recession (10%). For each gender, 40% do not have a gingiva recession.

Based on the results of muscle grip values and gingival recession examination conducted on Grade 6 students of SDN Cirendeu, a Pearson Chi-Square test was carried out to determine the relationship between the two variables and was presented as percentages. As many as (Table 5) one person has grip muscle strength with the strong category, and there is a recession (33.3%). Two people had moderate grip muscle strength and had a recession (28.6%). One person with grip muscle strength was in the weak category and had a recession (10%).

The number of students (Table 4) who did not have a recession with the strength of the grasped muscles in the firm, medium, and weak categories was as follows: 2 people (66.7%), nine people (71.4%), and five people (90%). Based on the results of the Pearson correlation test in Grade 6 students of SDN Cirendeu, it was found that the relationship between grasping muscle strength and gingival recession was not significant. With a test score of <0.5.

## DISCUSSION

This study aims to see the relationship between the strength of the grasping muscles and the occurrence of gingival recession. The target of the research was Grade 6 students at SDN Cirendeu, Cimahi City, Indonesia who had an average age of about 12 years. In this study, students were measured for grip muscle strength, and an intra-oral examination was carried out to see if there was a gingival recession. Calculating

muscle strength using a hand dynamometer has a value based on gender and is divided into weak, medium, and strong strength. In this study, the strength of the 12-year-old children's handheld muscles in boys was higher than that of girls by 17.52 ± 5.52 (Mean ± SD) and 20.96 ± 11.32 (Mean ± SD). In line with Bohannon et al.'s research, the grip strength in males in the dominant hand is more significant in value with each age.[16] Muscle strength is often associated with the ability to brush teeth and the level of health or disease in the oral cavity (caries or periodontal disease).[17]

Brushing is the most common way to eliminate plaque and prevent caries and periodontal disease. Brushing activities are carried out from the first eruption of the first tooth to the complete eruption of all adult teeth. Research by Pujar and Subbareddy (2013) stated that the effort to clean plaque is around 82% in 12-year-old children with an average brushing duration of 1.71 minutes.[18] 12-year-olds can carry out dental cleaning activities because of their ability to receive information and practice it. However, the significance of the effectiveness of brushing as a preventive measure is still low.[19] Deinzer et al.'s research stated that the average child brushed their teeth for about 200 seconds ± 80.48 seconds (mean ± SD), with a score of more than 55% still skipping the brushing of one sextant on the inner tooth surface and about 16% passing all parts. Only 7.5% of children brush their teeth on the outside and inside with intense movements.[19]

Brushing teeth affected by the strength of the hand muscles can be related to the cleanliness of the oral cavity. The strength of the hand muscles and the frequency, duration, and brushing technique can also affect it.[20,21] In Weidden et al.'s study, brushing with a force of 1 N was the recommended average strength.[6,12]

This force is considered to be the power of brushing teeth that are safe from impacting the hard tissues of the teeth and periodontal tissues. If the force increases, it can trigger damage to the brushing area. The effect that can occur in periodontal tissue due to tooth brushing is gingival recession. According to the research of Niemi et al., holding a toothbrush with a palm grip for 2 minutes causes more damage to the gingiva than a pen grip.[22]

This study explains the gingival recession in 12-year-old children, each in boys and girls, with an incidence of 10%. The recession as a whole is a class 1 Miller recession. In line with Marini's research, the prevalence, spread, and severity of recession are seen in clinical aspects that increase with age, with the most frequent frequency in Miller's recession class 1.[23] Research in Espoo, Finland, stated that the

prevalence of gingival recession in 12-year-old children is 39% dominated by female groups, the recession that occurs is mild (0.5 or 1 mm) and broad (1.5-3.5 mm) recession.[24]

The data generated from this study included grip muscle strength and gingival recession, which were tested by looking at the relationship. The results of the Pearson correlation test from this study were obtained from as many as 33.3% (p-value>0.5) who experienced gingival recession with strong grip muscle strength. It illustrates that the strength of the grip muscles is not related to the occurrence of a recession. According to research by Weijden et al. (2005), brushing in 1 minute can reduce plaque by an average of 39% with an average brushing force of 330 g. However, there was no correlation between the effectiveness and strength of brushing ($r=0.68$, $p<0.001$).[25] Gingival recession due to brushing can be affected by inaccurate brushing methods, manifesting over 20-30 years.[26] So at 12, there is very little pure gingival recession due to tooth brushing trauma due to excess grip muscle strength.

## CONCLUSION

The strength of the grip muscles is one of the crucial elements in assessing dental health because it is closely related to brushing teeth. The process of brushing teeth with great power can trigger a gingiva recession. In 12-year-old children, there was no significant relationship between the strength of the grasping muscles and the occurrence of recession due to tooth brushing trauma.

## CONFLICT OF INTEREST

The author stated that there was no conflict of interest against any party.


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