

Utilization of Special Grip Toothbrushes for Children with Cerebral Palsy

Burhanuddin Daeng Pasiga

Department of Dental Public Health, Faculty of Dentistry, Hasanuddin University, Makassar, Indonesia.
Corresponding Author: bpasiga@unhas.ac.id

ABSTRACT

Cerebral Palsy children with physical limitations have obstacles in doing daily activities, including in this case the act of brushing teeth, it is necessary to use a toothbrush with a special grip design so that they can hold a toothbrush when cleaning teeth. The purpose of this study is to determine the effectiveness of toothbrushes with a special handle on oral hygiene and the level of bad breath of patients with Cerebral Palsy. This type of research is Pre-Experimental with a design before and after testing. A total of 15 Cerebral Palsy patients who met the criteria for 21 physically disabled children at SLB - YPAC Makassar, Indonesia. A specially designed toothbrush is made by adding a toothbrush handle made of Clay, and then the patient grasps the material so that it is printed according to the handle. Assessment of oral hygiene based on the OHIS index and bad breath using the "Breath Checker" tool. The examination is carried out 3 times, namely before, after 3 days and 7 days. The result study based on the percentage of oral hygiene status both before and after the intervention occurred increased from 1.67% to 46.67%. The effectiveness of using a special toothbrush for Cerebral Palsy patients can reduce the OHIS value before and after the intervention by 37.1%. It also has an effect on changes in bad breath status where before the intervention of the use of toothbrushes most of the bad breath status was "moderate" (60%) and bad breath status as much as (40%), then after the intervention was obtained an increase in the percentage of bad breath in the category "mild" up to 60% and the percentage of the "No Odor" category by 40%. Based on the study conducted, the effectiveness of using a special toothbrush design using a special handle can be used to help clean the mouth and reduce bad breath for children Cerebral Palsy.

Keywords: Toothbrush with a special grip, Cerebral Palsy, Bad breath, Oral hygiene Index.

Correspondence:

[Burhanuddin Daeng Pasiga](mailto:bpasiga@unhas.ac.id)

Department of Dental Public Health, Faculty of Dentistry, Hasanuddin University, Makassar, Indonesia.

Corresponding Author: bpasiga@unhas.ac.id

INTRODUCTION

Cerebral palsy is the most common disability in children due to problems during pregnancy, childbirth and postpartum. Cerebral palsy includes a disorder caused by abnormal brain development or damage to the part of the brain that controls muscles and movement.^{1,2,3} Physical development disorders are also important for interpersonal relationships so that children affect the behavior of children, especially towards dental health care.^{4,5} Poor oral hygiene and gingival conditions in children with disabilities compared to other normal children have been widely reported.⁶

Children with disabilities are every child who has a physical or mental disability that can interfere with him to carry out activities like a normal child. According to WHO, children with disabilities are children who have obstacles in carrying out normal activities such as children their age in social activities, recreation, education, and field activities due to physical or mental conditions.¹ In Indonesia the population with disabilities is 2.45%. The percentage of children with disabilities (5-17 years) according to data from the Indonesia Basic Health Research 2018 is 3.3%. Where the 5 provinces with the highest proportion respectively were Central Sulawesi, North Kalimantan, Gorontalo, South Sulawesi, and West Sumatra.⁷

One type of disability is disorder in the limbs (hearing impaired). Physical disability is a movement disorder caused by neuromuscular (muscular nerve) abnormalities and bone structures that are congenital, sick or accidental, including cerebral palsy, polio, and paralysis. Children with physical impairment are incomplete / imperfect limbs, wilted and stiff limbs, difficulty in movement (imperfect, not flexible / uncontrolled, vibrating), abnormal limb and spine shape, limited joint motion, there obstacles in carrying out

activities of daily life, including in this case is the act of brushing teeth.^{8,9}

Patients who experience movement disorders in this case cerebral palsy have a higher risk of caries and periodontal disease. Lack of knowledge and motor impairment are considered as the main causative factors.⁹ Another study conducted in Brazil to determine the picture of the incidence of caries in children and adolescents with cerebral palsy and the results obtained that more than half (52.5%) of the subjects who participated in the study had at least one permanent tooth / deciduous tooth that had new carries for 4 years of monitoring (2004-2008).¹⁰

Mouth conditions that can trigger bad breath are lack of salivary flow, increased anaerobic gram-negative bacteria, an increase in the amount of food protein, a more alkaline pH of the oral cavity and an increase in the number of dead cells and necrotic epithelial cells in the mouth.¹¹ Bad breath results from bacterial decay, in which oral bacteria work on salivary proteins to produce compound products. Halitosis is bad breath that can be caused by the presence of volatile sulfur compounds (VSCs). Volatile sulfur compounds are the product of the production of anaerobic bacteria in the mouth which produce volatile sulfur compounds and smell bad.¹²

Poor oral and dental hygiene of children with disabilities is the ability to understand instructions in maintaining poor oral hygiene, poor motor skills and manual coordination in doing the practice of maintaining oral and dental hygiene. Dental and mouth hygiene of children with disabilities is worse than normal children of the same age because children with disabilities have an inability to control plaque like a normal child. Brushing teeth is the main plaque control that is done to maintain dental and oral hygiene.⁶ Generally, people with hearing impairment have the inability to obtain good oral hygiene

by brushing their teeth manually because they have limited motor skills, and their lack of knowledge about the effectiveness of brushing teeth and how to maintain oral and dental hygiene.¹³

The design of a toothbrush, the length of time of brushing and the ability to brush your teeth also determine the effectiveness of brushing your teeth. Conventional toothbrushes are the main tools used to clean teeth and mouth. Today many toothbrushes on the market have a variety of shapes, sizes, and degrees of bristle hardness. One of the things that must be considered in brushing your teeth is how to hold a toothbrush. When brushing your teeth, the handle of the toothbrush must be held firmly enough to effectively clean the teeth. The handle of the toothbrush must be easy to grasp. The limitations experienced by cerebral palsy sufferers make children not meet their own needs and must get assistance from others, including the ability to hold a toothbrush to clean their teeth. Then we need to think of a special form of toothbrush for them, so in this study researchers made a toothbrush with a special handle that is made from materials that are easily available and easy to make. For children, it's best not to be slippery, comfortable, and easily controlled by children.¹⁴

Materials that can be used for modification of toothbrush handles are Velcro strap, silicone putty, plastazote tubing, sponges, bicycle handlebar grips, soft rubber or Styrofoam balls. In this study, researchers wanted to use clay as a material for modification of the toothbrush handle. It is based on the nature of clay which is easily formed and can harden by itself.^{15,16}

The purpose of this study was to determine the effectiveness of toothbrushes with a special grip on the reduction of dental plaque, oral hygiene and levels of bad breath for patients with Cerebral Palsy in Extraordinary Schools, Educational Foundation for Children with Disabilities in Makassar, Indonesia.

METHOD

Types of research

This type of research is Pre-Experimental with the design of this study is the pre and post-test design.

Research subject

The subjects of the study were cerebral palsy children with impaired hand motor function in SLB-D YPAC Makassar. There are 21 children with physical disabilities in YPAC Makassar SLB-D Makassar. 18 children have impaired motor function in the hands, which will then be the subject of research. After going through the inclusion and exclusion criteria, there are 15 children left who can meet the exclusion criteria and participate in the study. This study was approved by the Hasanuddin University Dental Ethics Commission, and with permission from the school and parents to fill out informed consent.

Definition of Variable Operations

- The use of modified toothbrushes is the use of conventional toothbrushes that have been modified using clay material added to the handle of the toothbrush to facilitate the adaptation of the toothbrush grip.
- Oral hygiene status is a condition that shows a buildup of plaque or tartar on a tooth that can be seen clinically and measured using the Oral Hygiene Index Simplified Index (OHI-S)
- Bad breath status is a bad odor coming from the mouth which is measured using a breath

checker from Tanita © Breath Checker Slim white HC-212S-WH.

- Effectiveness is the percentage obtained from the difference in the average value of oral hygiene or bad breath score between the time of measurement divided by the average value or score of the initial measurement or previous measurement multiplied by 100%.

Assessment criteria

1. Oral Hygiene status assessments

Index to measure oral hygiene status using the Oral Hygiene Index Simplified (OHI-S) index. by Greene and Vermillion (1964). OHI-S score criteria are as follows: Good (good), if the value is between 0-1.2; Medium (fair), if the value is between 1.3-3.0; Poor (poor), if the value is between 3.1 - 6.0.

2. Assessment of Bad Breath Status

Breath checker is a simple portable monitoring tool from Tanita © Breath Checker Slim white HC-212S-WH that can measure someone's breath odor by interpreting someone's breath odor on a scale of 0-5. The numbers on the screen will count down from 5 to 1. Slowly shake 4-5 times before. This will remove odors and moisture left behind on the appliance. When the word "starts" appears on the screen, immediately blow up the device sensor until you hear a beep (blow about 4 seconds with a distance of ± 1 cm from the device). The score will appear on the screen and be recorded immediately, then disappear after a few seconds and automatically deactivated. The breath check scale scores contained in the instrument use instructions are as follows: 0 = no odor; 1 = mild mouth odor; 2 = bad breath; 3 = severe bad breath; 4 = strong bad breath; 5 = bad breath is very strong.

Data analysis

Statistical analysis:

- Test to determine whether the data is normally distributed or not with Shapiro-Wilk test,
 - Repeated ANOVA test, the paired average difference test for > 2 measurements when the data is normally distributed, Friedman test, paired difference test for > 2 measurements if the data are not normally distributed.
 - Bonferroni post hoc test, a further test of the Repeated Anova test.
 - Wilcoxon Sign Ranks post-hoc test, a further difference test from the Friedman test.
- In this study, this test was used to determine differences in the average OHI-S values between each examination time based on sex and age.
- Kruskal-Wallis test, unpaired difference test for > 2 groups and > 1 measurement, used if the data are not normally distributed.

Data processing: using Microsoft Excel 2010 and software program PC+ SPSS version 22

Research procedure

1. Manufacture of modified toothbrushes

- Clay was placed around the handle of a toothbrush
- Subjects were instructed to grip the handle of a toothbrush as when brushing teeth
- Printouts are stored and allowed to dry

2. Intra-oral clinical examination

- Initial examination to measure the status of oral hygiene using the OHI-S index and bad breath

was measured using a Breath Checker before the intervention using a special toothbrush.

- b) Give instructions to research subjects to use special toothbrushes and toothpaste that have been prepared by researchers. The brush is done with a frequency of twice a day for seven days.
- c) Check the status of cleanliness and bad breath on days 3 and 7 of the use of a modified toothbrush.

RESULT

This research was conducted at the SLB-YPAC (Special school), Makassar City. Subjects in this study were children with physical disabilities with total impairment of motor function in the hands of 21 people aged between 7-17 years. A total of 18 children who experienced motor problems at hand according to the criteria and there were 3 children who did not attend research time. Of these 15 people, there were 7 people who experienced a certain type of Cerebral Palsy, 2 people with specific types of cerebral palsy with hemiplegia type, 2 people with specific cerebral palsy with paraplegia, 2 people with specific types of Cerebral Palsy with retardation and 1 person with cerebral palsy with mixed types. Characteristics of the sample by sex, male (73.3%) and female (26.7%). Whereas based on age it was found that subjects aged 6-9 years were 7 people (46.7%), aged 13-15 years were 4 people (26.7%) and those aged 16-17 years were 4 people (26, 7%).

Figure 2 shows the OHIS values for the group of men with an average value before the intervention (1.98) decreased to 1.68 on the third day there was a decrease of 15.15%, whereas in the sex of women with a higher percentage decrease 19.34%.

Figure 3 shows the effectiveness of the use of toothbrushes to decrease the OHI-S value from day-0 (2.02 ± 0.46) to day-3 (1.68 ± 0.35) by 16.8%, from day-3 (1.68 ± 0.35) to the 7th day (1.27 ± 0.30) at 24.4%, and from day-0 (2.02 ± 0.46) to the 7th day (1.27 ± 0.30) 37.1.

Figure 4 shows the decrease in average bad breath score also occurred from day-0 to day-3 by 16.8%, from day-0 to day-7 by 62.7%, and from day-3 to day-7 by 54, 8%.

Figure 5 shows the percentage of oral hygiene level before the intervention obtained "medium" status was 14 people (93.33%), while the "good" status was 1 person (1.67%). On day 3 the percentage of oral hygiene status was "moderate" (66.7%) and there was an increase in the percentage of "good" status to (33.33%). On day 7, the percentage of status was increasing to 8 people (53.33%), and the "good" category increased to 7 people (46.67%).

Figure 6, shows the percentage of bad breath status before the intervention using toothbrush mostly in the "media" status (60%) and the status of bad breath as much (40%), then after the intervention the percentage of bad breath in the "mild" category increased to 60%, and an increase in the percentage of "odorless" categories by 40%.

Table 1 shows that there were significant differences in the mean values of CI-S, DI-S, OHI-S, and bad breath scores between the time of examination on day 0 (before the use of modified toothbrushes), day 3 and day 7 after the use of a modified toothbrush. The results of the Repeated Anova test on the average value of DI-S and OHI-S showed a significant difference between the examination time of day 0, day 3 and day 7 with a value of $p < 0.05$. Friedman's test results also showed a significant

difference in the mean CI-S value and bad breath with a p value < 0.05 .

Table 2 shows that there are significant differences in the average value of DI-S, OHI-S, and bad breath score between the time of examination day 0 and day 3, while the mean value of CI-S does not have a significant difference between the time of examination day 0 and day 3 ($p = 0.063$). Bonferroni test results showed a significant difference in the average value of DI-S and OHI-S between the time of the 0-day and 7-day and also between the time of the 3rd and 7th day. Wilcoxon test results also showed differences in the mean value of CI-S and bad breath between the time of examination of the 0 and 7 days and also between the time of days 3 and 7.

DISCUSSION

The subjects in this study were children with physical disabilities who experienced motor disturbances in the hands, due to physical limitations in this case motor function (movement) so that children could not make efforts to clean their teeth and mouth.^{15,17} A person with a physical disability is someone who has bodily abnormalities in the apparatus of motion which includes bones, muscles, and joints both in structure or function that can interfere or constitute obstacles and obstacles for him to carry out activities properly. Cerebral palsy is a type of disability.¹⁸

Cerebral palsy refers to non-progressive disorders that result from lesions in the immature brain that cause limited activity and deliberate movement disorders. This is the main cause of physical disabilities as a child that limits the ability of children to perform various daily activities properly. Neurological defects include neuromuscular and musculoskeletal problems, spasticity, muscle contractures, lack of coordination, loss of motor control and poor voluntary movements.¹³

Another study states that the abilities of children with mental disabilities at the age of 12 experience difficulty in holding and using a toothbrush. Research conducted in Ludhiana, India regarding dental health status in cerebral palsy children shows that 40% of children have bad OH, 32% with moderate OH, and 28% with good OH [19]. Another study in Egypt found that children suffering from Cerebral Palsy with a percentage of poor oral hygiene as much as 53.2%.²⁰

The presence of plaque from poor oral hygiene can lead to a reduction in salivary deficits.²¹ Saliva can also clean the mouth and eliminate bacteria (self-cleansing), but because the saliva levels of each person are different. In individuals who have a little salivary flow can cause xerostomia, which can cause bad breath.²²

Modified handle toothbrushes are conventional toothbrushes that are enlarged according to the handle of each individual. The material used to enlarge the handle of the toothbrush is clay. Clay is a material that is easy to get, easy to shape, and can dry if aerated so that the manufacturing process is not difficult. Modified toothbrushes are aimed at individuals who have motor limitations in grasping and using a toothbrush. Increasing the volume of the toothbrush handle can stabilize the grip making it easier for individuals to control and use a toothbrush. Previous research, researchers have tested the effectiveness of this special grip toothbrush against patients with Ischemic Stroke, obtained meaningful results can reduce the oral hygiene of stroke patients.²³

Research conducted in Rio de Janeiro, Brazil, in the form of a cross-sectional survey showed that the prevalence of halitosis in men is three times higher than in women,

regardless of age. Also, the risk of halitosis is three times higher in people aged 20 years or older than those aged 20 years and under by looking at gender.²⁴

This study shows there is a decrease in the average value of DI-S and OHI-S between the time of the 0 and 7-day inspection and also between the time of the 3rd and 7th day. The percentage of OHI-S decreased by 45% after the intervention on the first day and increased by 52.2% on the 7th day. The result of impairment of OHIS using a special grip toothbrush occurred also with a study conducted in Indonesia in the group of stroke patients making a decrease from before and after the intervention on the first day for the DI-S value of 51.54%, before and after the intervention on the day to 7 at 89.23%.

This study also showed a significant difference in the average value of DI-S, OHI-S, and bad breath score between the time of examination day 0 and day 3, while the mean value of CI-S had no significant difference between time inspection day 0 and day 3. A decrease in bad breath score can be caused by handling oral hygiene by reducing the accumulation of debris and bacteria in the mouth that produce malodor through regular oral hygiene procedures namely brushing teeth and the use of antimicrobial toothpaste or mouthwash.²⁵

CONCLUSION

The effectiveness of using a special toothbrush design using a special handle is proven to help clean the mouth and reduce bad breath for children with Cerebral Palsy

ACKNOWLEDGMENT

Through this opportunity the researcher would like to thank the SLB-YPAC leadership who gave their permission and cooperation so that the research could be carried out and to Mr. Steven and Ms. Windah, they are professional level students in the Registrar's Office in the Dental Health Department of the Faculty of Dentistry Hasanuddin University who have helped and supervised during the research.

REFERENCES

1. Bhambal, A., Jain, M., Saxena, S., & Kothari, S. (2011). Oral health preventive protocol for mentally disabled subjects—A review. *Journal of Advanced Oral Research*, 2(1), 21-26.
2. Rao, D., Amitha, H., & Munshi, A. K. (2005). Oral hygiene status of disabled children and adolescents attending special schools of South Canara, India. *Hong Kong Dent J*, 2(2), 107-113.
3. Wyne, A. H. (1958). *Oral Health of Cerebral Palsy Children and Determination of Potential for Its Improvement* (Doctoral dissertation, UNIVERSITY OF GREIFSWALD). <https://epub.ub.uni-greifswald.de/frontdoor/deliver/index/docId/2244/file/Dr+med+dent+Thesis+Amjad+H+Wyne.pdf>
4. Crego, A., Carrillo, M., Armfield, J. M., & Romero, M. (2014). From public mental health to community oral health: the impact of dental anxiety and fear on dental status. *Frontiers in public health*, 2, 16. <https://doi.org/10.3389/fpubh.2014.00016>
5. Coric, A., Banozic, A., Klaric, M., Vukojevic, K., & Puljak, L. (2014). Dental fear and anxiety in older children: an association with parental dental anxiety and effective pain coping strategies. *Journal of pain research*, 7, 515. <https://dx.doi.org/10.2147%2FJPR.S67692>
6. Jamkhande, A., Hegde-Shetiya, S., & Shirahatti, R. (2013). Comparison of powered toothbrush with or without parental assistance with manual toothbrush on plaque and gingivitis in mentally challenged children of 12-18 years in pune, india. *JPDA*, 22(01), 42.
7. Ministry of Health and National Institute of Health Research and Development. (2018). National report on basic health research, Riskesdas, 2018.
8. Nasional DP. Indonesia Dictionary. Fourth. Jakarta:Gramedia:2008.
9. Jan, B. M., & Jan, M. M. (2016). Dental health of children with cerebral palsy. *Neurosciences*, 21(4), 314. <https://dx.doi.org/10.17712%2Fnsj.2016.4.20150729>
10. Ferreira de Camargo, M. A., Frias, A. C., & Antunes, J. L. F. (2011). The incidence of dental caries in children and adolescents who have cerebral palsy and are participating in a dental program in Brazil. *Special Care in Dentistry*, 31(6), 210-215. <https://doi.org/10.1111/j.17544505.2011.00213.x>
11. Gani, D. K., Dudala, R. B., Mutthineni, R. B., & Pabolu, C. H. (2012). Halitosis, diagnosis and management in daily practice: Dentist stance. *IOSR J Dent Med Sci*, 2, 34-7.
12. Widagdo, Y., & Suntya, K. (2007). Volatile sulfur compounds sebagai penyebab halitosis. *Jurnal Kedokteran Gigi Universitas Mahasaraswati*, 5(2), 112-120.
13. Case-Smith, J., & O'Brien, J. C. (2014). *Occupational therapy for children and adolescents-e-book*. Elsevier Health Sciences.
14. Martens, L., Marks, L., Goffin, G., Gizani, S., Vinckier, F., & Declerck, D. (2000). Oral hygiene in 12-year-old disabled children in Flanders, Belgium, related to manual dexterity. *Community dentistry and oral epidemiology*, 28(1), 73-80. <https://doi.org/10.1034/j.16000528.2000.280110.x>
15. Dougall, A., & Fiske, J. (2008). Access to special care dentistry, part 4. Education. *British Dental Journal*, 205(3), 119-130. <https://doi.org/10.1038/sj.bdj.2008.652>
16. Pasiga, B. D. (2018). The ability of elderly to clean plaque on full denture prosthesis using toothbrush with special grip design. *Int J Dent Med Sci Res*, 2(1), 22-7.
17. Diéguez-Pérez, M., de Nova-García, M. J., Mourelle-Martínez, M. R., & Bartolomé-Villar, B. (2016). Oral health in children with physical (Cerebral Palsy) and intellectual (Down Syndrome) disabilities: Systematic review I. *Journal of clinical and experimental dentistry*, 8(3), e337. <https://dx.doi.org/10.4317%2Fjced.52922>
18. Ministry of Health R. (2014). Center for Data and Information Ministry of the Republic of Indonesia. InfoDatin Center for Data and Information Ministry of the Republic of Indonesia.
19. Adlakha, V. K., & Joshi, J. L. (2011). Oral status of a group of cerebral palsy children. *Journal of Dentistry and Oral Hygiene*, 3(2), 18-21. <https://doi.org/10.5897/JDOH.9000030>
20. Sedky, N. A. (2018). Assessment of oral and dental health status in children with cerebral palsy: An exploratory study. *International journal of health sciences*, 12(1), 4.
21. Woon, C. (2017). Improving oral hygiene for stroke patients. *Aust J Neurosci*, 27(1).

Utilization of Special Grip Toothbrushes for Children with Cerebral Palsy

22. Bollen, C. M., & Beikler, T. (2012). Halitosis: the multidisciplinary approach. *International journal of oral science*, 4(2), 55-63. <https://doi.org/10.1038/ijos.2012.39>
23. Pasiga, B. D., & Dewi, C. (2019). The Effectiveness of the Use of " Special Grip Toothbrushes" on Dental Hygiene for Indonesian Patients with Ischemic Stroke. *Pesquisa Brasileira em Odontopediatria e Clínica Integrada*, 19. <https://doi.org/10.4034/pboci.2019.191.32>
24. Nadanovsky, P. A. U. L. O., Carvalho, L. B. M., & Ponce de Leon, A. (2007). Oral malodour and its association with age and sex in a general population in Brazil. *Oral diseases*, 13(1), 105-109. <https://doi.org/10.1111/j.16010825.2006.01257.x>
25. Van Den Broek, A. M. W. T., Feenstra, L., & De Baat, C. (2008). A review of the current literature on management of halitosis. *Oral diseases*, 14(1), 30-39. <https://doi.org/10.1111/j.16010825.2006.01350.x>



Figure 1. Example of special toothbrush results

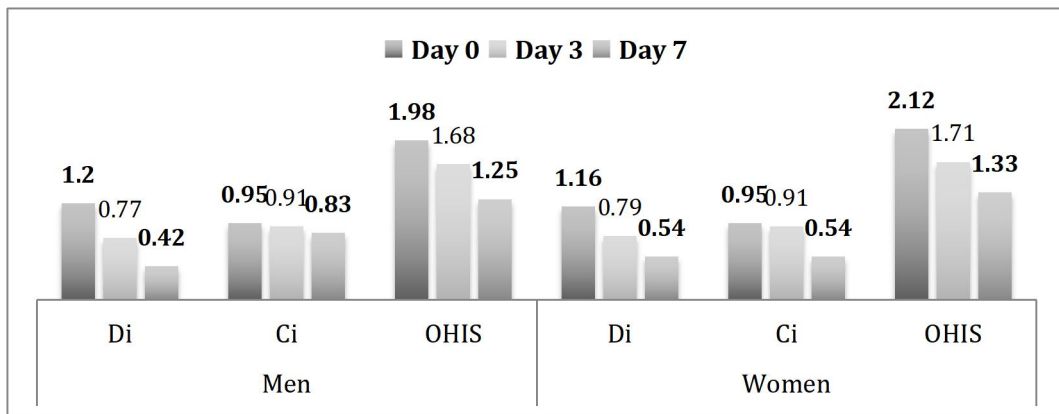


Figure 2. Average Di, Ci and OHIS scores before and after brushing teeth by sex

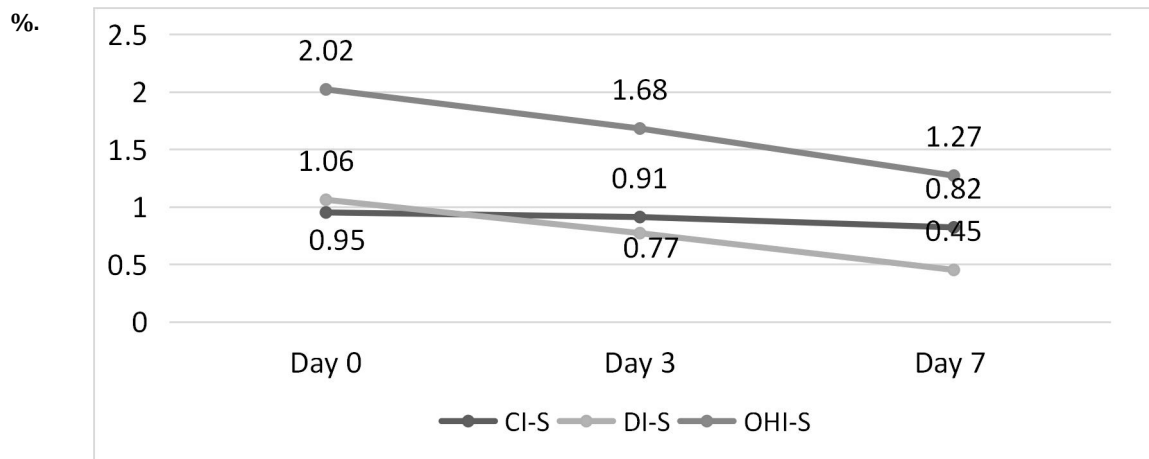


Figure 3. Mean values of CI-S, DI-S, and OHI-S before the use of a modified handled toothbrush (day 0) and after the use of a modified (days 3 and 7)

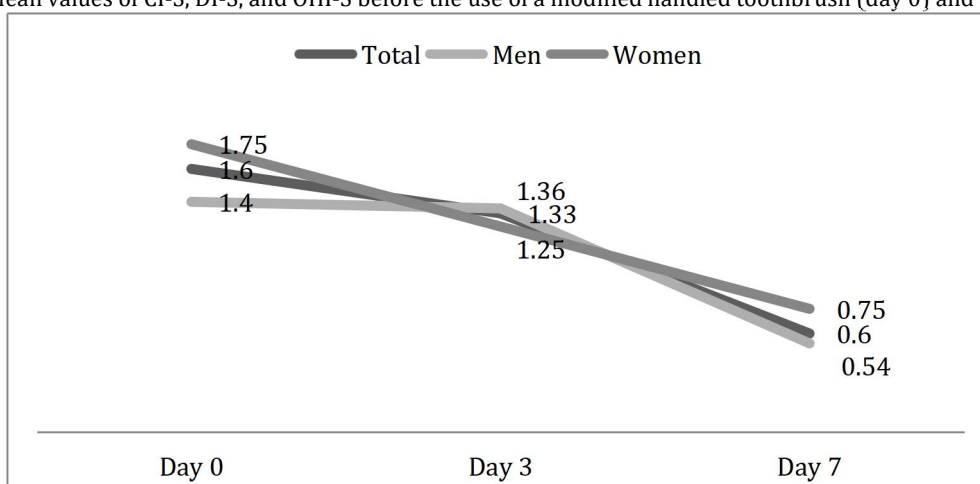


Figure 4. Average bad breath score before and after the use of toothbrushes (day 0, day 3 and day 7)

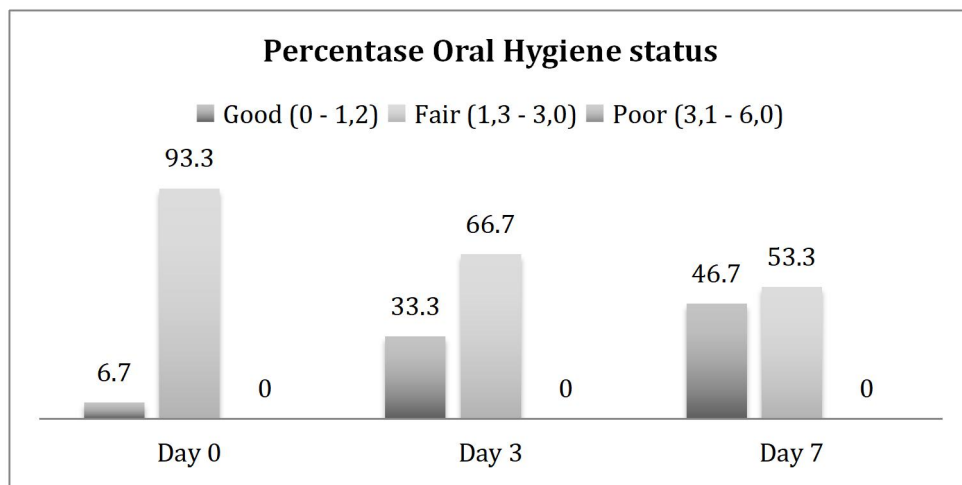


Figure 5. Percentage of oral hygiene level based on OHI-S values before and after the use of toothbrushes

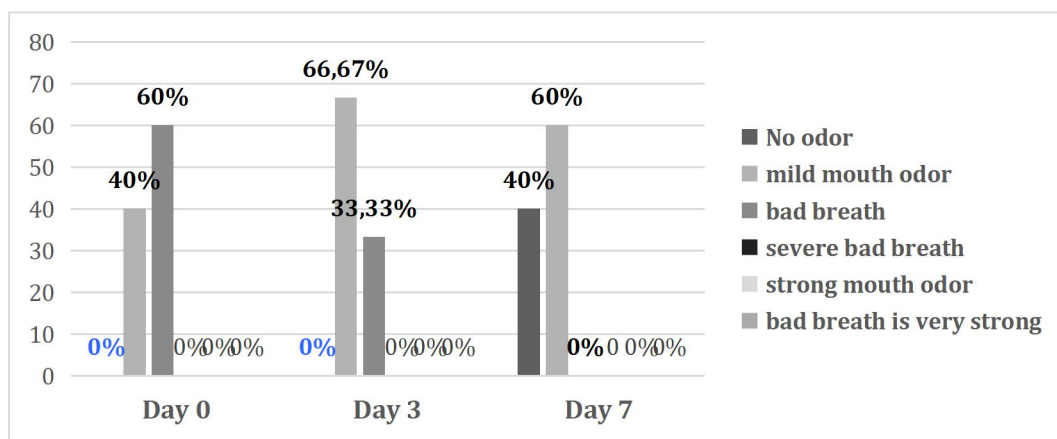


Figure 6. Prevalence of the level of bad breath at the time of examination on day 0 (before the use of a modified toothbrush, the 3rd and 7th day after the use of a modified toothbrush)

Table 1. Difference in mean CI-S, DI-S, OHI-S values, and bad breath scores based on the time of examination (before and after the use of toothbrushes)

Score	n	Measurement Time			p-value
		Day-0	Day-3	Day-7	
		(Rerata ± SD)			
CI-S	15	0.95 ± 0.23 ^b	0.91 ± 0.24 ^b	0.82 ± 0.20 ^b	0.001 ^{**}
DI-S	15	1.06 ± 0.26 ^a	0.77 ± 0.13 ^a	0.45 ± 0.14 ^a	0.000 [*]
OHI-S	15	2.02 ± 0.46 ^a	1.68 ± 0.35 ^a	1.27 ± 0.30 ^a	0.000 [*]
Breath Odor	15	1.60 ± 0.50 ^b	1.33 ± 0.48 ^b	0.60 ± 0.50 ^b	0.000 ^{**}

^a Normality Test: Shapiro-Wilk test; $p > 0.05$

^b Normality Test: Shapiro-Wilk test; $p < 0.05$

^{*} Repeated Anova test; $p < 0.05$: significant

^{**} Friedman test; $p < 0.05$: significant

Table 2. Post Hoc test for differences of mean CI-S, DI-S, OHI-S values, and bad breath scores between examinations (before and after the use of toothbrushes)

Comparison		CI-S	DI-S	OHI-S	Breath odor
		(p-value)			
Day-0	Day-3	0.063 ^b	0.000 ^a	0.000 ^a	0.046 ^b
	Day-7	0.004 ^b	0.000 ^a	0.000 ^a	0.000 ^b
Day-3	Day-7	0.026 ^b	0.000 ^a	0.000 ^a	0.001 ^b

^a Post Hoc test: Bonferroni test; $p < 0.05$: significant

^b Post Hoc test: Wilcoxon Signed Ranks test; $p < 0.05$: significant