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The Effectiveness of Using an Electric Toothbrush as a Plaque Control Tool in School-Autistic Children

Sukanto¹, Prima Rahman Lazuardi², Tantin Ermawati³, Niken Probosari⁴, Dyah Setyorini⁵, Roedy Budirahardjo⁶, Berlian Prihatiningrum⁷, Amandia Dewi Pemana Shita⁸

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ABSTRACT

Background: Autism is a condition of developmental abnormalities that have an impact on various aspects of life, including dental and oral health. An electric toothbrush is needed as a means of plaque control. Electric toothbrushes offer advantages such as timer features, increase accessibility, etc.

Purpose: This study aims to determine the effectiveness of electric toothbrushes as a means of plaque control in children with autism.

Methods: This study used the One Group Pretest Posttest research design and consisted of 24 subjects. This study used the Loe and Silness plaque index measurement. Before the research, education was carried out on the research subjects. The study was conducted by comparing the effectiveness of manual and electric toothbrushes on research subjects. Index scores were recorded before and after treatment.

Results: The use of manual and electric toothbrushes both reduced the Loe and Silness plaque index scores. The use of a manual toothbrush reduced the mean plaque index score by 0.828 (34.07%). The use of an electric toothbrush reduced the average plaque index score by 1.10 (48.24%). The results of the paired t test ($P < 0.05$) showed that there was a significant difference between the use of a manual toothbrush and an electric toothbrush.

Conclusion: The use of an electric toothbrush can reduce plaque scores and is effective as a means of plaque control in school-age autistic children.

KEYWORDS: Autism, electric toothbrushes, manual toothbrushes, Loe and Silness plaque index, plaque control

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INTRODUCTION

Autism is a condition of developmental abnormality that affects several aspects, especially how children see the world and learn from their experiences. Autistic people have characteristics such as inhibited communication, disturbances in behavior, and not easy in carrying out social interactions called the autistic triad.¹ Internally, autism can be caused by genetic factors. Environmental factors such as nutrient intake during pregnancy, air pollution, and exposure to mercury are known to trigger the onset of autism.^{2,3} The prevalence of autism is critical for informing public policy, raising awareness, and developing research priorities.⁴ Epidemiological data estimate the global prevalence of Autism Spectrum Disorder (ASD) at one in 160 people.⁵ In another survey, it was found that 2-3% of children aged 3 years to 17 years were diagnosed with ASD.^{6,7} In Indonesia,

it is estimated that every year there is an increase in autistic people as many as 6900 children.⁸

People with autism experience various disorders such as cognitive, sensory, communication, to social skills.^{9,10} This condition can trigger various health problems, including dental and oral health. Dental and oral health problems that are often experienced by children with autistic conditions are dental caries, bruxism, gingivitis, traumatic conditions, tooth eruption abnormalities, to environmental damage to the oral cavity.¹¹ The majority of autistic children have oral hygiene status (OHI-S) in the moderate category (66%) and caries index in the medium category (51%).¹² This condition is caused by high dependence on parents or teachers in maintaining dental and oral health.¹¹ Efforts are needed in the form of plaque control to improve the dental and oral health of autistic children.

Plaque control can be carried out through mechanical and chemical efforts.¹³ Mechanical control of plaque can be done by brushing your teeth.¹⁴ Mechanical plaque control can better remove plaque accumulation on the interproximal and supragingival sections.¹⁵ In its use, the ability to brush teeth properly and correctly is an important factor for the maintenance of healthy teeth and mouth.¹⁶ One of the mechanical plaque control devices is an electric toothbrush.

Electric toothbrush is a DC/battery-powered toothbrush that can cause mechanical movement on the brush head.¹⁷ Electric toothbrushes offer advantages such as not requiring special techniques in their use, having a timer feature, increasing accessibility in the oral cavity, etc. The use of electric toothbrushes has proven effective as a plaque control tool compared to manual toothbrushes.^{14,18} This is evidenced by a decrease in plaque index score in blind people, a decrease in Patient Hygiene Performance Index in Down Syndrome, and a decrease in OHI-S score in autism.¹⁸⁻²⁰ Based on these conditions, it is the basis for research on the effectiveness of electric toothbrushes as a means of plaque control in school-age autistic children.

MATERIALS AND METHODS

This research has received ethical approval from the Health Research Ethics Commission of the Faculty of Dentistry, University of Jember with an ethics letter No.1928/UN25.8/KEPK/DL/2023. This research was carried out at SLB Negeri Branjangan from January to March 2023. This study used the One Group Pretest Positive research design.²¹ Sampling in this study used Total Sampling technique.²² The research subjects used in the study were individuals with autistic conditions totaling 24 people. The subjects of the study came from elementary to high school education levels with details of elementary school 12 children (50%), junior high school 6 children (25%), and high school 6 children (25%). In this study, the tools used were manual toothbrushes and electric toothbrushes. The measurement used in this study was the plaque index of Loe and Silness (1964) which focused on examining plaque accumulation on teeth 12, 16, 24, 32, 36, and 44.²³ The score of the Loe and Silness plaque index ranges from 0-3.

The implementation of the research was carried out in 3 visits. The first visit contained counseling activities on Roll brushing techniques, duration, and frequency of brushing teeth. The choice of Roll brushing technique is because it offers good interproximal cleaning and is safe for the gingiva.²⁴ Besides being easy to do, this technique is also able to clean plaque effectively.²⁵ The second visit contained activities using a manual toothbrush. The activity began with examining plaque accumulation before treatment on research subjects. After the examination, the research subjects brushed their teeth using a manual toothbrush as a treatment. After treatment, plaque accumulation examination is carried out after treatment. The third visit was made 1 week after the second visit. The activities of the third visit were largely the

same as with the second visit. The difference is the treatment that uses an electric toothbrush.

RESULTS

Data from the examination of the Loe and Silness plaque index before treatment using a manual toothbrush obtained an average value of 2.43. The score is classified as poor (2.0 - 3.0). The results of plaque index examination after treatment using a manual toothbrush obtained an average value of 1.61. The value is classified as fair category (1.0 - 1.9). The mean value of the difference in plaque index score in treatment using a manual toothbrush was 0.828.

Data from the examination of the Loe and Silness plaque index before treatment using an electric toothbrush obtained an average value of 2.28. The score is classified as poor (2.0 - 3.0). The results of plaque index examination after treatment using an electric toothbrush obtained an average value of 1.18. The value is classified as fair category (1.0 - 1.9). The average value of the difference in plaque index scores in treatment using an electric toothbrush was 1.10. After obtaining the research data, data analysis was then carried out using normality, homogeneity, and paired T tests.

The results of the Shapiro-Wilk normality test show the overall P value of the available data is above 0.05. On this basis, it can be concluded that the entire data is normally distributed and homogeneity tests can be carried out. The results of the Levene homogeneity test showed that the overall P value of the available data was above 0.05. On this basis, it can be concluded that the entire data is ensured to be homogeneous and can be performed in paired T test.

The paired T test is an analytical method that aims to test the significant difference between the mean of two related observations on the same subject.^{26,27} The paired T test results show that the overall P value of the available data is below 0.05. Based on the results of paired T tests, it can be concluded that brushing your teeth using a manual or electric toothbrush can effectively reduce plaque accumulation. Based on the results of the examination and the results of the paired T test, it can be concluded that electric toothbrushes can reduce plaque accumulation more effectively than manual toothbrushes.

DISCUSSION

American Psychiatric Association, Autism Spectrum Disorder (ASD) is a complex developmental disorder condition that involves constant challenges in every verbal and nonverbal communication, behavior, to social interaction.²⁸ During the preparation and execution process, the research subjects showed various reactions when meeting the researcher. These reactions include fear, anger, aggression, anxiety, etc. This condition corresponds to the fact that autism has characteristics such as anxiety (42-56%), hyperactivity (28-44%), depression (12-70%), and aggressive habits up to 68%.²⁹ An estimated 50% of children with ASD

exhibit disruptive behaviors, such as tantrums, aggression, self-harm, and disobedience.³⁰

The limitations possessed by autistic individuals have an impact on various aspects, one of which is the aspect of oral and dental health. Based on the examination conducted by researchers, the study subjects had an average plaque index score in the poor category (2.0-3.0). Based on the survey, it is known that 57.1% of autistic people have moderate oral hygiene status and 70% of autistic people experience caries and periodontal disease.¹²

Plaque control is needed to minimize the risk of oral and dental health in children with autism. One method of plaque control is to use a toothbrush that includes mechanical plaque control.^{31,32} Toothbrushes are the most widely used oral hygiene aids to date. The toothbrush is also a major instrument used widely to achieve the goal of plaque control.¹⁴ The results showed that the use of manual or electric toothbrushes proved effective as a means of mechanical plaque control in autistic children. This is evidenced by the decline in plaque scores from the poor category to fair.

The results showed that the use of a manual toothbrush as a plaque control tool could reduce the plaque score of the Loe and Silness index by an average of 0.828 (34.07%). The use of manual/conventional toothbrushes can reduce plaque accumulation by an average of 38.17%, reduce the Plaque Index (PI) score in blind people by an average of 0.477 ± 0.156 , and reduce the average OHI-S score in autistic children.^{18,19,33} Manual toothbrushes are designed to reach and clean most areas of the oral cavity efficiently. Manual toothbrushes offer several advantages such as easy to use, easy to clean, durable, and affordable.¹⁴

The results showed that the use of an electric toothbrush as a plaque control tool could reduce the plaque score of the Loe and Silness index by an average of 1.10 (48.24%). The use of electric toothbrushes can reduce plaque accumulation by an average of 58.3%, reduce the Plaque Index (PI) score in blind people by an average of 1.299 ± 0.319 , and reduce the average OHI-S score more significantly in autistic children than manual toothbrushes.^{18,19,33} Electric toothbrushes are indicated in various individuals with low levels of manual dexterity, one of which is autistic.¹⁷ Electric toothbrushes have various features such as rotational and counter-oscillating brush head movement, timer, ultrasonic vibration (>20 kHz), etc.^{17,33}

The results of the paired T test show that there is a significant difference from the use of manual and electric toothbrushes. Based on these tests, electric toothbrushes have been shown to be more effective than manual toothbrushes. This is supported by research that states the use of electric toothbrushes is more effective in reducing plaque index scores in blind people, reducing Patient Hygiene Performance Index scores in Down Syndrome, and reducing OHI-S scores in autism compared to manual toothbrushes.¹⁸⁻²⁰

The effectiveness of manual toothbrushes as a plaque control tool that is lower than electric toothbrushes is influenced by several things, one of which is motor limitations of the user. children with ASD often have motor skill deficits that appear at a young age. Autistic children also experience motor abnormalities suffered by more than 79% of autistic people.^{29,34,35} This is in contrast to electric toothbrushes where their use does not require special brushing techniques, uses lower power, and is easier to control.^{14,34}

The advantage of electric toothbrushes is that they can more easily remove plaque through automatic oscillations of the toothbrush head and prevent gingivitis because the pressure sensor owned by the electric toothbrush can be adjusted so as to reduce enamel and gingival damage. Electric toothbrush oscillations and rotations are more effective in removing plaque than manual toothbrushes, can more easily remove plaque, and reduce the risk of gingival damage on first use.³⁴ Electric toothbrushes have also been shown to reduce the incidence of bleeding during probing compared to manual toothbrushes.³⁶

CONCLUSION

Based on the results of the study, it can be concluded that electric toothbrushes can reduce plaque scores and are effective as a plaque control tool in school-age autistic children.

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