

Investigation of the Effects of Oral Care Methods on Oral Health in Children with Asthma Using Inhalers: A Quasi-Experimental Trial

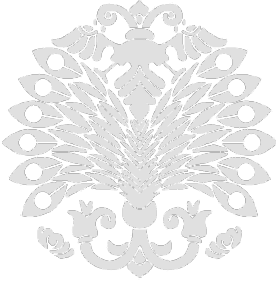
İnhaler İlaç Kullanan Astımlı Çocuklarda Ağız Bakım Yöntemlerinin Ağız Sağlığına Etkisinin Araştırılması: Yarı Deneysel Bir Çalışma

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ABSTRACT

Objective: This study was conducted to determine the effects of tooth brushing, wiping the mouth with bicarbonate, and rinsing the mouth with water on the oral care of children with asthma using inhalers.

Methods: The study used a quasi-experimental quantitative research design with a pretest-posttest control group. The sample of 6-10-year-old asthmatic children was divided into the tooth brushing training group (n=49), the bicarbonate mouth wiping training group (n=49), the water rinsing training group (n=49), and the control group (n=49). Data were collected using a "Sociodemographic Information Form" and an "Oral Assessment Guide". The oral assessment guide was re-administered 6 weeks after the children had received the education.

Results: The findings showed that the gums were better in the group applying the wiping the mouth with bicarbonate method ($P=.046$), swallowing complaints decreased in the group applying the rinsing the mouth with water method ($P=.003$), and mucous membranes were better in the group applying the wiping the mouth with bicarbonate method ($P=.046$).

Conclusion: As a result of the study, the method of rinsing the mouth with water was found to be more functional. Accordingly, it is recommended to rinse the mouth with water after using inhaler medication.

Keywords: Asthma, nursing, oral health

ÖZ

Amaç: Bu çalışma, astım tanısı konulmuş inhaler ilaç kullanan çocuklarda diş fırçalama, ağız bikarbonat ile silme ve ağız su ile çalkalamanın ağız bakımına etkisini belirlemek amacıyla yapılmıştır.

Yöntemler: Çalışmada ön test-son test kontrol gruplu yarı deneysel nicel araştırma deseni kullanılmıştır. 6-10 yaş arası astımlı çocukların örnekleme; diş fırçalama eğitim grubu (n=49), bikarbonatlı ağız silme eğitim grubu (n=49), su çalkalama eğitim grubu (n=49) ve kontrol grubundan (n=49) oluşmuştur. Veriler, "Sosyodemografik Bilgi Formu" ve "Ağız Değerlendirme Formu" kullanılarak toplanmıştır. Ağız değerlendirme formu, çocuklara eğitim verildikten 6 hafta sonra tekrar uygulanmıştır.

Bulgular: Bulgular, bikarbonat yöntemi ile ağız silme uygulayan grupta diş etlerinin daha iyi olduğunu ($P=.046$), su ile çalkalama yöntemini uygulayan grupta yutma şikayetlerinin azaldığı ($P=.003$), ve bikarbonat ile ağız silme yöntemi uygulanan grupta oral mukozanın daha iyi olduğu görüldü ($P=.046$).

Sonuç: Çalışma sonucunda, ağız su ile çalkalama yöntemi daha işlevsel bulundu. Buna göre inhaler ilaç kullanımı sonrasında ağız su ile çalkaması tavsiye edilmektedir.

Anahtar Kelimeler: Astım, hemşirelik, ağız sağlığı

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INTRODUCTION

Asthma is defined as a chronic respiratory disease characterized by inflammation and bronchoconstriction, causing wheezing, coughing, and dyspnea.¹⁻³ It affects more than 300 million people worldwide, and it is thought that 100 million new cases will be diagnosed in 2025. The prevalence, morbidity, and mortality rates of asthma are increasing year on year, and asthma is one of the most common chronic diseases in preschool children.⁴ Although asthma ranks first among childhood chronic diseases and mostly persists in childhood, it can occur at any age. However, 30% of patients are about one-year-old, and the first symptoms appear before the age of 4–5 in 80%–90% of patients. The disease reaches its highest prevalence between the ages of 6 and 11.⁵ The prevalence of asthma in school-age children in the USA was reported to be 8.5%–12.2%, compared with 6.9%–15.3% in Turkey.⁶

Asthma can be controlled with the regular use of drugs; however, both long-term use and use of these drugs more than once during the day can result in oral health problems. It has been reported that the long-term use of inhaler drugs decreases the intraoral pH level and saliva production in children and increases the risk of the formation of dental caries.^{3,7,8}

Although inhaled corticosteroids (ICS) used in the treatment of asthma are the most effective controlling and strongest anti-inflammatory drugs, steroids are known to have serious local and systemic side effects.^{4,9} Rinsing the mouth with water after ICS use is widely recommended; however, other oral care methods may be more effective in reducing side effects.¹⁰ Prior studies evaluating interventions for maintaining oral health have primarily involved cancer patients and patients treated in intensive.¹¹⁻¹⁵ Studies are needed to compare effectiveness of different oral care methods in the outpatient setting. In this study, we investigated the effects of tooth brushing, wiping the mouth with bicarbonate, and rinsing the mouth with water on the oral care of 6–10-year-old children with asthma who used ICS, and presented to the University Hospital Pediatric Allergy Polyclinic in the province.

AIM

This study was carried out to assess the effects of three methods (tooth brushing, wiping the mouth with bicarbonate, and rinsing the mouth with water) applied after ICS use on oral health and to determine the main outcomes in the mouth.

Research Hypothesis

H₁: Children who rinse their mouths with water after inhaler

use will achieve better oral health (oral assessment guide) compared to children who wipe their mouths with bicarbonate after inhaler use, brush their teeth after inhaler use, or follow their usual oral care routine.

METHODS

Type of Research

This is a quasi-experimental quantitative study with a pretest-posttest control group.

Setting and Sampling

The study was carried out at a University Hospital Pediatric Allergy Outpatient Clinic between February and September 2019. The sample size of the study was determined using the G* Power 3.1.9.2 software package. For this purpose, the mean and standard deviation (SD) values of previous studies were used.² Accordingly, the sample size was calculated as 196 subjects for the four groups, based on the following values: $\alpha=0.05$, $\beta=0.20$ (80% power), and $F=0.24$. The inclusion and exclusion criteria for the study sample are as follows:

The study included children aged 6–10 years with a diagnosis of asthma, who had been followed up for at least two months, who had been using ICS daily, whose parents agreed to participate in the study, and who had no communication problems. Patients who had to use drugs during an attack period were excluded from the study.

After we obtained written informed consent from the parents, the patients were divided into four groups by using the simple randomization method, according to the appointment system of the clinical responsible physician and according to the days of the week. The researchers only knew the groups of the patients based on the day. They were blinded to the patients' appointment days and therefore did not know which day the patients were scheduled for. In order to avoid interaction, each group was created from patients presenting to the clinic on one of the four days: Monday, Tuesday, Wednesday, and Friday. Since patients were not admitted to the polyclinic on Thursday, it was skipped (Figure 1).

Data Collection Tools

The Sociodemographic Information Form: This form consists of 30 questions designed to collect descriptive data about the children and their parents (child's age, gender, education level, mother's age, father's age, mother's education level, father's education level, mother's employment status, father's employment status, family type, number of individuals living in the family, and income level).

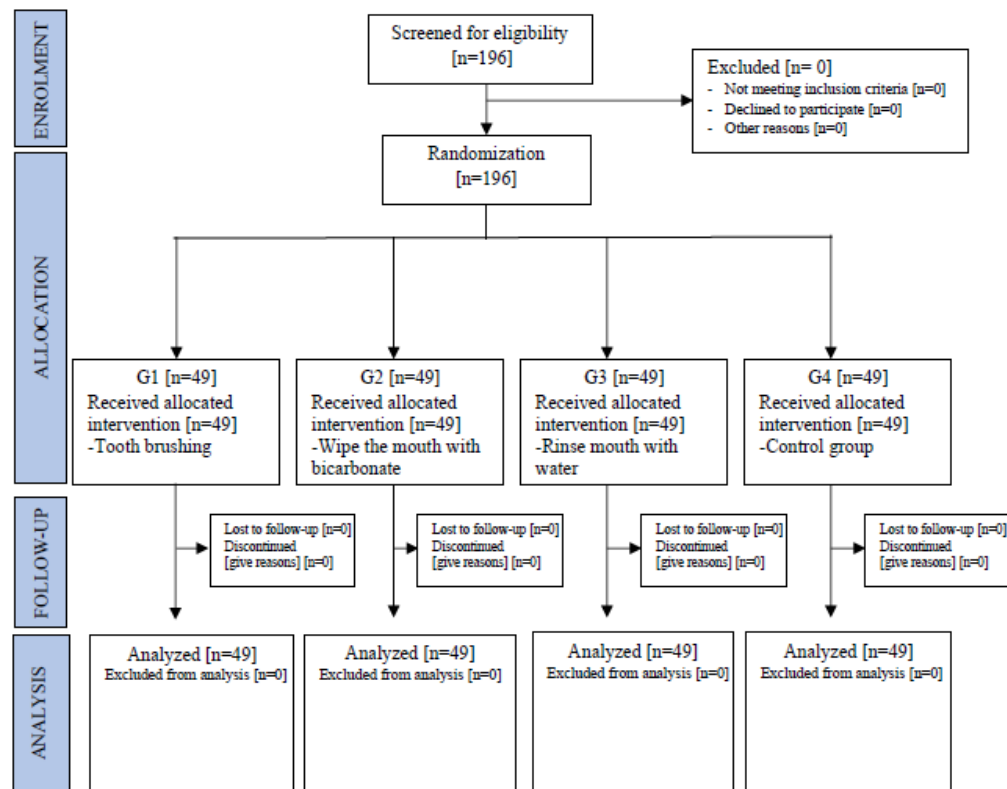


Figure 1. CONSORT 2010 Flow Diagram

The Oral Assessment Guide

This guide was created by Eilers et al.¹⁶ It questions oral and dental health under eight different titles. It is used to assess the condition of voice, swallowing, lips, tongue, saliva, mucous membranes, gums, and teeth or dentures. Oral assessment scores are determined by assigning each variable 1, 2, or 3 points and summing them up. Oral assessment guide scores ranging between 8 and 24.¹⁷ According to the oral assessment guide, low scores mean good oral health, while high scores indicate a negative change in oral health.

Intervention Procedures

The sociodemographic information form and oral assessment guide were administered to the families who presented to the outpatient clinic. Oral care training (i.e., brushing teeth, wiping the mouth with bicarbonate, rinsing the mouth with water) was provided by the researcher, who has three years of clinical experience in the field of pediatric nursing. After the training, training brochures prepared separately for each application group were given to the participants. Opinions regarding the training brochures were received from three lecturers who are experts in the field of child health and diseases nursing. Necessary corrections were made in line with their

suggestions, and the brochure was given its final shape.

The oral assessment guide before and after the training was performed by the nurse in the pediatric allergy outpatient clinic. The researcher was blinded during the application of the guide. Patients were scheduled to return 6 weeks after the first examination and the training; therefore, the oral assessment guide was re-administered when they came to the clinic. In the home environment, the parents of the participants were asked to take notes daily, according to the study groups after the use of ICS, whether they applied or did not implement appropriate interventions. After inhaler use, interventions suitable for the study groups were asked to be applied twice a day.

Tooth brushing (group 1): The patients who presented to the outpatient clinic on Mondays were given education on tooth brushing after using inhaled drugs. The tooth brushing education was given using an oral care education brochure, and the brochures were given to the patients at the end of the education. The content of the education was as follows: "After the use of drugs that reach the respiratory tract directly, some side effects, such as changes in voice and thrush in the mouth and on the tongue can be seen. To avoid these side effects, teeth should be brushed after each drug use."

Oral care with bicarbonate (group 2): The patients who presented to the outpatient clinic on Tuesdays were given education on wiping the mouth with bicarbonate after using inhaled drugs. The education on wiping the mouth with bicarbonate was given using an oral care education brochure, and the brochures were given to the patients at the end of the education. The content of the education was as follows: "After the use of drugs that reach the respiratory tract directly, some side effects, such as changes in voice and thrush in the mouth and on the tongue can be seen. In order to avoid these side effects, the mouth should be rinsed with carbonated water prepared with a teaspoon of bicarbonate (dining soda) into a tea glass of water after each drug use."

Rinsing the mouth with water (group 3): The patients who presented to the outpatient clinic on Wednesdays were given education on rinsing the mouth with water after using inhaled drugs. The education on rinsing the mouth with water was given using an oral care education brochure, and the brochures were given to the patients at the end of the education. The content of the education was as follows: "After the use of drugs that reach the respiratory tract directly, some side effects, such as changes in voice and thrush in the mouth and on the tongue can be seen. In order to avoid these side effects, the mouth should be rinsed with plenty of water after each drug use." Control group (group 4): Patients who came to the polyclinic on Fridays constituted the control group.

Data Analysis

Data were analyzed on SPSS 25.0 (IBM SPSS Statistics 25 software (Armonk, NY: IBM Corp.)) software package. Continuous variables were represented as mean \pm standard deviation, median, and minimum-maximum values, and categorical variables were represented as counts and percentages. The normality of the data was examined with the Shapiro-Wilk test. Kruskal-Wallis Analysis of Variance was used to compare independent group differences. Wilcoxon paired-samples test was used in dependent groups. When significance was determined between the groups as a result of Kruskal-Wallis Analysis of Variance, Bonferroni-corrected Mann-Whitney U test was used to determine the groups causing the significant difference. In addition, Chi-square analysis was used to compare categorical variables. In all analyses, $P < .05$ was considered statistically significant.

Ethical Aspect of the Research

Before the study was initiated, necessary permissions were obtained from Pamukkale University Clinical Research Ethics Committee (Issue: 60116787-020/90540 and date

31/12/2018). An informed consent form was obtained from the parents of children. The study was carried out in full compliance with the Declaration of Helsinki (2013).

RESULTS

The distribution of the groups by the demographic characteristics of the participants is given. There were NSD (not significantly different) in demographic characteristic between groups (Table 1). When the asthma-related characteristics of the groups were examined, no difference was found between the groups in terms of having an asthma attack in the last year ($P = .400$), the severity of the attack ($P = .790$), hospitalization ($P = .251$), cough ($P = .374$), dyspnea ($P = .448$), wheeze ($P = .197$), and mucus variables ($P = .719$). Regarding the status of having an asthma attack in the last year, the rate of not having asthma attacks was high in all groups. The severity of asthma attacks was found to be moderate in all groups. According to the examination of hospitalization status, non-hospitalization was high in all groups. The examination of the asthma symptoms indicated the following: cough was present at a high-rate day and night in all groups, dyspnea was high both during the day and night in group 1, and wheezing and mucus complaint were high neither in the day nor the nighttime category (Table 2).

Table 3 shows the oral care of the groups following a routine practice. According to the results, there was no significant difference between the groups in terms of oral care ($P = .421$), frequency of daily oral care ($P = .198$), and oral care method employed after drug use ($P = .331$). Considering the frequency of oral care of the groups following routine practice, tooth brushing was found to be high in all groups. When the oral care method employed after drug use was examined, non-use of oral care methods after drug use was high in all groups.

In the home environment, the families of the participants reported that appropriate interventions were administered twice daily, according to the study groups, after the use of ICS. Table 4 shows the distribution of the participants' scores from the "Oral Assessment Guide" before and after the education. In terms of voice variable, the post-education scores of the groups decreased compared to their pre-education scores and the difference was statistically significant ($P < .001$). However, it was determined that there was no statistical difference between the mean scores of the groups ($P = .143$; $P = .107$). In terms of the swallowing variable, there was no statistically significant difference between the pre- and post-education scores of groups 1, 2, and 4.

Table 1. Distribution of Parents and Children Participated in The Study by Their Sociodemographic Characteristics

Sociodemographic Characteristics		Group 1		Group 2		Group 3		Group 4		P*
		n	%	n	%	n	%	n	%	
Child's Gender	Female	22	44.9	16	32.7	17	34.7	21	42.9	.525
	Male	27	55.1	33	67.3	32	65.3	28	57.1	
Child's education level	Primary school graduate	29	59.2	38	77.6	37	75.5	38	77.6	.120
	Secondary school graduate	20	40.8	11	22.4	12	24.5	11	22.4	
	Primary school graduate	4	8.2	2	4	6	12.2	4	8.1	
Mother's education level	Secondary school graduate	8	16.3	11	22.4	15	30.6	12	24.5	.371
	High school graduate	31	63.3	27	55.1	21	42.9	22	44.9	
	University graduate	6	12.2	9	18.5	7	14.3	11	22.5	
	Primary school graduate	3	6.1	4	8.1	6	12.2	3	6.1	
Father's education level	Secondary school graduate	16	32.7	7	14.3	10	20.4	5	10.2	.058
	High school graduate	17	34.7	26	53.1	26	53.1	22	44.9	
	University graduate	13	26.5	12	24.5	7	14.3	19	38.8	
Mother's profession	Worker	22	44.9	24	49.0	17	34.7	17	34.7	.360
	Unemployed	27	55.1	25	51.0	32	65.3	32	65.3	
Father's profession	Worker	45	91.8	45	91.8	47	95.9	46	93.9	.811
	Unemployed	4	8.2	4	8.2	2	4.1	3	6.1	

*P < .05 Statistically significant difference; Chi-square analysis

Table 2. Characteristics of the Groups Regarding Asthma

Asthma-related characteristics		Group 1		Group 2		Group 3		Group 4		P
		n	%	n	%	n	%	n	%	
Having an asthma attack in the past year	Yes	7	14.3	8	16.3	6	12.2	10	20.4	.400
	No	42	85.7	41	83.7	43	87.8	39	79.6	
Severity of the attack	Mild	3	42.9	2	25.0	3	50.0	4	40.0	.790
	Moderate	4	57.1	6	75.0	3	50.0	6	60.0	
Hospitalization	Yes	8	16.3	8	16.3	7	14.3	14	28.6	.251
	No	41	83.7	41	83.7	42	85.7	35	71.4	
Cough	Only daytime	6	12.2	1	2.0	3	6.1	2	4.1	.374
	Only nighttime	9	18.4	6	12.2	6	12.2	7	14.3	
	Both day and nighttime	31	63.3	33	67.4	33	67.4	36	73.5	
	Neither day nor nighttime	3	6.1	9	18.4	7	14.3	4	8.1	
Dyspnea	Only daytime	8	16.3	6	12.2	4	8.2	10	20.4	.448
	Only nighttime	2	4.1	3	6.1	6	12.2	4	8.2	
	Both day and nighttime	22	44.9	19	38.8	16	32.7	13	26.5	
	Neither day nor nighttime	17	34.7	21	42.9	23	46.9	22	44.9	
Wheeze	Only daytime	1	2.0	2	4.1	2	4.1	6	12.2	.197
	Only nighttime	1	2.0	-	-	2	4.1	3	6.1	
	Both day and nighttime	1	2.0	3	6.1	4	8.1	2	4.1	
	Neither day nor nighttime	46	93.9	44	89.8	41	83.7	38	77.6	
Mucus	Only daytime	3	6.1	2	4.1	2	4.1	5	10.2	.719
	Only nighttime	5	10.2	3	6.1	3	6.1	4	8.1	
	Both day and nighttime	3	6.1	5	10.2	1	2.0	2	4.1	
	Neither day nor nighttime	38	77.6	39	79.6	43	87.8	38	77.6	

*P < .05 Statistically significant difference; Chi-square analysis

Table 3. Oral Care of Groups Following a Routine Practice

Oral care		Group 1		Group 2		Group 3		Group 4		P
		n	%	n	%	n	%	n	%	
Oral care	Tooth brushing	47	95.9	48	98	48	98	49	100	.421
	Rinsing the mouth with water	2	4.1	1	2	1	2	-	-	
Frequency of daily oral care	Once a day	17	34.7	17	34.7	28	57.2	25	51.0	.198
	Twice a day	28	57.1	29	59.2	18	36.7	20	40.8	
	Three times a day	4	8.2	3	6.1	3	6.1	4	8.2	
Oral care method following the drug use	Tooth brushing	4	8.2	4	8.2	5	10.2	9	18.4	.331
	Rinsing the mouth with water	5	10.2	6	12.2	8	16.3	2	4.1	
	None	40	81.6	39	79.6	36	73.5	38	77.5	

*P < .05 Statistically significant difference; Chi-square analysis

Table 4. Findings of The Comparison of the Pre-and Post-Interventional Mean Scores of the Groups Obtained from The Oral Assessment Guide

Oral assessment criteria		Group 1	Group 2	Group 3	Group 4	P*
		$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	
Voice	Pre-education	1.37 ± 0.49	1.41 ± 0.5	1.57 ± 0.58	1.33 ± 0.47	.143 ^b
	Post-education	1.1 ± 0.31	1.02 ± 0.14	1.14 ± 0.35	1.16 ± 0.37	.107 ^b
	P	.0001 ^{*a}	.0001 ^{*a}	.0001 ^{*a}	.0110 ^{*a}	
Swallowing	Pre-education	1.59 ± 0.5	1.73 ± 0.45	1.67 ± 0.47	1.78 ± 0.42	.222 ^b
	Post-education	1.45 ± 0.5	1.67 ± 0.47	1.41 ± 0.5	1.69 ± 0.47	.005 ^{*b}
	P	.071 ^a	.439 ^a	.003 ^{*a}	.248 ^a	
Lips	Pre-education	1.35 ± 0.48	1.24 ± 0.43	1.33 ± 0.47	1.35 ± 0.48	.660 ^b
	Post-education	1.16 ± 0.37	1.16 ± 0.37	1.1 ± 0.31	1.12 ± 0.33	.764 ^b
	P	.007 ^{*a}	.317 ^a	.005 ^{*a}	.005 ^{*a}	
Tongue	Pre-education	1.1 ± 0.31	1.02 ± 0.14	1 ± 0	1 ± 0	.009 ^{*b}
	Post-education	1.06 ± 0.24	1 ± 0	1.02 ± 0.14	1.02 ± 0.14	.275 ^b
	P	.317 ^a	.317 ^a	.317 ^a	.317 ^a	
Saliva	Pre-education	1.18 ± 0.39	1.12 ± 0.33	1.04 ± 0.2	1 ± 0	.006 ^{*b}
	Post-education	1.1 ± 0.31	1.12 ± 0.33	1.06 ± 0.24	1 ± 0	.093 ^b
	P	.157 ^a	1 ^a	.655 ^a	1 ^a	
Mucous membranes	Pre-education	1.43 ± 0.5	1.1 ± 0.31	1.18 ± 0.39	1.2 ± 0.41	.001 ^{*b}
	Post-education	1.33 ± 0.47	1.02 ± 0.14	1.33 ± 0.47	1.41 ± 0.5	.0001 ^{*b}
	P	.197 ^a	.046 ^{*a}	.035 ^{*a}	.008 ^{*a}	
Gums	Pre-education	1.22 ± 0.42	1.08 ± 0.28	1.31 ± 0.47	1.31 ± 0.47	.026 ^{*b}
	Post-education	1.14 ± 0.35	1 ± 0	1.27 ± 0.45	1.24 ± 0.43	.001 ^{*b}
	P	.206 ^a	.046 ^{*a}	.564 ^a	.405 ^a	
Teeth	Pre-education	1.39 ± 0.49	1.51 ± 0.51	1.43 ± 0.5	1.35 ± 0.48	.404 ^b
	Post-education	1.41 ± 0.5	1.49 ± 0.51	1.49 ± 0.51	1.43 ± 0.5	.791 ^b
	P	.655 ^a	.763 ^a	.317 ^a	.371 ^a	

*P < .05 Statistically significant difference; a: Wilcoxon paired-samples test; b: Kruskal-Wallis Analysis of Variance; \bar{X} , Mean; SD, Standard deviation

The post-education scores of groups 3 decreased compared to their pre-education scores, and the difference was statistically significant ($P=.003$). Although there was no difference between the mean scores of the groups before the education ($P=.222$), the post-education difference between the mean scores of all groups was determined to be statistically significant ($P=.005$). The post-education

means scores of 1st group ($P=.007$), 3rd group ($P=.005$), and 4th group ($P=.005$) were found to be lower regarding the lip's variable than their pre-education scores and the difference was statistically significant. In addition, the difference between the mean scores of all groups, both before ($P=.660$) and after the education ($P=.764$), was not statistically significant. There was no difference between

the mean scores of the groups before and after the education in terms of the saliva and tongue variables ($P>.05$). The difference between the mean scores the variable of the tongue of the groups was statistically significant before the education ($P=.009$), but not after ($P=.275$). The difference between the mean scores the variable of the saliva of the groups was statistically significant before the education ($P=.006$), but not after ($P=.093$). Regarding the variable of the mucous membrane, it was found that the post-education scores decreased in group 2 compared to the pre-education scores ($P=.046$) but increased in 3rd group ($P=.035$) and 4th group ($P=.008$) and that the difference was statistically significant. The difference in group 1 was found to be not statistically significant ($P=.197$). The difference between the pre- and post-education mean scores of the groups was statistically significant ($P=.001$). When the gums were examined, it was determined that the post-education scores of the 2nd

group decreased compared to their pre-education scores and that the difference was statistically significant ($P=.046$). The difference between the pre- and post-education mean scores of the groups was found to be statistically significant ($P=.001$). Regarding the teeth variable, no significant difference was found between the mean scores of all groups before and after the education (Group 1: $P=.655$; group 2: $P=.763$; group 3: $P=.317$; group 4: $P=.371$). Likewise, there was no statistical difference between the mean scores of the groups before ($P=.404$). and after the education ($P=.791$).

After the study, it was determined that the oral evaluation scores were significant in groups 1, 2 and 3 ($P<.001$), while there was no change in the control group (group 4) ($P=.099$). In addition, it was found that the difference between the study and control groups before ($P=.405$) and after the training ($P=.110$) was not statistically significant ($P=.110$) (Table 5).

Table 5. Findings of the Comparison of the Pre-and Post-Interventional Total Mean Scores of the Groups Obtained from The Oral Assessment Guide

Group's	Pre-education $\bar{X}\pm SD$	Post-education $\bar{X}\pm SD$	P
Group 1	10.63±1.37	9.75±1.19	.0001 ^a
Group 2	10.22±1.17	9.48±0.96	.0001 ^a
Group 3	10.53±1.15	9.81±1.42	.0001 ^a
Group 4	10.30±0.96	10.08±1.20	.099 ^a
P	.405 ^b	.110 ^b	

*P < .05 Statistically significant difference; a, Wilcoxon paired-samples test; b, Kruskal-Wallis Analysis of Variance; \bar{X} , Mean; SD, Standard deviation

DISCUSSION

This study was conducted to determine the effects of tooth brushing, wiping the mouth with bicarbonate, and rinsing the mouth with water on the oral care of children with asthma using inhalers. As a result of the study, the method of rinsing the mouth with water was found to be more functional.

The study, it was determined that the mouth evaluation scores were significant in the groups in which brushing, wiping the mouth with bicarbonate and rinsing the mouth with water were significant, but there was no change in the control group. In addition, it was found that the difference between the study and control groups before and after the training was not statistically significant. In the post-intervention, voice and dryness of the lips variables in the tooth brushing group (group 1); in the group wiping the mouth with bicarbonate (group 2) after the intervention the variables of voice, mucous membranes, and gums; in the group in which the mouth was rinsed with water (group 3), it was found that the mean scores of voice, swallowing, lips, and mucous membranes variables decreased

significantly after the intervention (Table 4). Accordingly, hypothesis 1 "rinsing the mouth with water one of the oral care methods of the children; is more effective than tooth brushing, wiping the mouth with bicarbonate, and control group according to the sound, swallowing, dryness in the mouth, mucous membrane variable." was accepted within the limitations of the study.

The literature on basic oral care includes tooth brushing twice a day and rinsing the mouth with sodium bicarbonate or saline.¹⁸⁻²⁰ In clinical practice, it is known that routine oral care is generally used in patients with chronic diseases such as cancer and receiving treatment in intensive care, but no routine oral care practices for asthma patients have been encountered.¹³⁻¹⁵

Dysphonia and dryness in the mouth can be seen due to the particles remaining in the mouth after inhaled drug use and the side effects of steroid drugs.^{21,22} Voice problems are the most common and most disturbing local side effects of inhaled corticosteroids, and they affect not only patients' adherence to treatment but also their quality of life.²³ No studies investigating the effects of inhalers on voice in

children with asthma were found. However, it is known that inhaler cause dysphonia.²⁴⁻²⁷ After the education sessions, it was observed that the awareness of the patients was raised and that their voice complaints decreased in all groups. This result shows that, depending on the oral care methods used by the patients, selective benefit is obtained in one symptom and there is no change in other symptoms (such as swallowing, tongue, saliva).

Very little of the inhaled drugs reach the lungs. Due to the topical effect of these drugs on the oral mucosa, particles remaining in the oropharynx are seen as candidiasis infection. Candidiasis can also cause pain in the mouth and difficulty in swallowing.²⁸ Shivashankaran et al.²⁹ reported that salivary fluidity decreased after long-term use of inhalers. Studies have shown that inhaled corticosteroids reduce salivary IgA and cause candidiasis.^{3,7} We recommend that children with asthma should practice oral care to increase salivary fluidity and prevent the development of candidiasis after inhaled drug use.

In addition to the use of bronchodilators in patients with asthma, dryness of the mouth and lips may increase due to mouth breathing.⁷ Doğan et al.³⁰ reported that a geographic tongue appearance characterized by yellowish and whitish lines and shapes on the surface of the tongue was found in 8 out of 115 children with asthma who use inhaler drugs. In our study, we found similar side effects on the tongue surface of the children after drug use. Sköld et al.³¹ stated that inhaled drugs triggered the formation of caries in children as they lowered the intraoral pH level. Doğan et al.³⁰ found that 49.4% of the children with asthma had dental caries and that 28.2% had a toothache. It was also found that children who practiced oral hygiene more than three times a day had a higher prevalence of dental erosion than children who practiced it once a day.⁹ It is thought that tooth decay and sensitivity in the gums may have increased due to particles remaining in the mouth since all of the inhaled drugs cannot reach the lungs.

As a result of the study, it was found that the most effective oral care method after inhaler drug use is rinsing the mouth with water. This result is thought to be due to the limited range of scores of the oral assessment tool used in the study (1–3), and the methods used depend on the checklist and the statements of the participants. In addition, it can be said that the participants have weak adherence to the use of the recommended oral care method. The importance of oral care in children with asthma is increasing due to the side effects of inhaled drugs used to treat asthma. Apart from routine oral care, oral care that can be done to remove the drug particles remaining in the

mouth after inhaler drug use can be effective. Considering that the participants were not in a hospital environment; It has been seen that the most practical and easiest way is rinsing the mouth with water, as obtained in the study after the use of inhalers. However, it has been observed that oral care applications after the use of the inhaler drug ensure the elimination of the particles remaining in the mouth and a decrease in the variables. It is recommended that more research be conducted on this subject to support the study.

Limitations of the Study

This study involves some significant limitations that are worthy of note. First of all, studies involving larger sample sizes will be required to define on the oral care of children with asthma using inhalers. The feasibility of the applications in the home environment could not be observed in this study. The parent checklist and the statements of the participants are the limitations of the research. Finally, the findings of the study cannot be generalized for all children with asthma using inhalers.

In conclusion, it was found that children who used inhaled drugs habitually brushed teeth, but that they did not perform oral care at a high rate after drug use. Rinsing the mouth with water, especially after the use of the inhaler drug, reduced the complaints of swallowing sound, swallowing, and dryness of the lips and mucous membranes in children, while other oral care methods applied by children effectively reduced the voice complaints.

The inhaled corticosteroids used in the treatment of asthma are the most effective means of controlling asthma symptoms and risk for exacerbations in the majority of subjects. These steroids are known to have local and systemic side effects. Therefore, oral care implemented after the use of inhalers is important to prevent and minimize these side effects. Interventions to reduce oral symptoms may be particularly beneficial, as the presence of these side effects may lead to avoidance of ICS use. The study findings indicate that subjects experiencing selected symptoms (voice, swallowing, lips, tongue, saliva, mucous membranes, gums, teeth), may benefit from use of one of the tested methods.

In the literature, there are not enough studies on oral care practices in children diagnosed with asthma and using inhaler medication. It is thought that this research will contribute to this gap in the literature.

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