Evaluation and comparison of the efficacy of low fluoridated and calcium phosphate-based dentifrice formulations when used with powered and manual toothbrush in children with autism

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Abstract

Background: Autism is a neurobiological disorder characterized by impaired social interaction, communication difficulties, and lacking manual dexterity. These limitations make the oral hygiene maintenance very difficult. Aim: The aim of this present study is to evaluate and compare the efficacy of low fluoridated and calcium phosphate-based dentifrice formulations when used with powered and manual toothbrush in children with autism. Setting and Design: Sample comprised 22 children with autism who daily visited a day care and education center named ARUSHI - a center for children with special health care needs in Bhopal. Methods: Children were divided into two groups (Group A and B) according to toothbrush used and further divided into subgroups (A1 and B1 [low fluoridated – Pediflor toothpaste] and A2 and B2 [calcium sucrose phosphate – Enafix toothpaste]). Oral hygiene instructions and brushing technique demonstration were given every day for a period of 1-month. Oral health status was evaluated before and after the study using simplified oral hygiene index (OHI-S) and its Miglani’s modification for primary dentition, plaque index (PI), gingival index (GI), and decayed, missing, and filled teeth (DMFT)/deft index. The perception of parents regarding oral hygiene practices for their kids was also evaluated by an awareness and attitude questionnaire. Statistical Analysis: OHI-S, GI, PI, and DMFT/deft were statistically evaluated using Mann–Whitney U-test. Results and Conclusion: Mean value of OHI-S decreased significantly with powered toothbrush (0.035 [P < 0.05]) in both groups. However, PI decreased significantly for Enafix when used with powered toothbrush (0.042 [P < 0.05]). Perception of parents was seen to improve significantly after 1-month study (0.000 [P < 0.05]).

Keywords: Autism, calcium sucrose phosphate, low-fluoridated toothpaste, powered toothbrush

Introduction

Autism is a developmental and neuropsychiatric disorder characterized by impairments in communication and social interaction accompanied with repetitive or restricted behavior. These impairments have the potential to make oral health care difficult by creating obstacles for dental practitioner by limiting the use of many basic behavioral management techniques.[1] These children have unmet oral health care needs due to poor motor coordination, less learning abilities, and sensory problems (sensitivity to the bristle of brush and taste of toothpaste). They also exhibit damaging oral habits such as bruxism or pica. Poor oral care coupled with usually strong affinity for sweets increases the risk of developing caries and periodontal disease.[2,3] The present study aims to evaluate and compare efficacy of low fluoridated and calcium phosphate-based dentifrice formulations when used with powered and manual toothbrush in children with autism.

Methods

The study comprised 22 children with autism who were availing day boarding facility at ARUSHI - a center for education and training for children with special health care needs in Bhopal, Madhya Pradesh, India. Written informed consent was obtained from the parents, and an ethical approval was obtained from the Institutional Ethical Committee, People’s College of Dental Science and Research Centre, People’s University, Bhopal.
Oral hygiene screening was carried out for all 22 children who were divided into two groups: Group A (n = 11) - who used powered toothbrush and Group B (n = 11) - who used manual toothbrush. These two groups were further subdivided into A1 and B1 (low fluoridated — Pediflor toothpaste) and A2 and B2 (calcium sucrose phosphate — Enafix toothpaste).

Children were clinically examined at their institution while seated on comfortable chair under natural light. The indices evaluated were simplified oral hygiene index (OHI-S), its Miglani’s modification for deciduous dentition, decayed, missing, and filled teeth (DMFT)/deft, and gingival and plaque indices. During examination, if participants were uncooperative, additional approach was used to encourage the cooperation by songs being sung by school staff along with the use of basic behavior management techniques (tell-show-do technique, short, clear verbal commands, differential verbal reinforcement, live modeling, humor, and use of physical restraint) where appropriate.

Following oral examination, demonstration of brushing technique to children, parents, and teachers using audiovisual aids was done along with the distribution of oral hygiene information manuals in the form of pamphlets, CD/DVDs, etc. Diet chart of these children was obtained and diet counseling was done on subsequent visits. Parents were asked to fill the awareness and attitude questionnaire about oral hygiene practices, oral habits, medical and dental history of their child, etc. To keep a track of regular brushing as instructed, parents were asked to mark on a pocket-sized form as and when brushing was performed.

Motivation and reinforcement sessions were carried out twice a week for the entire 1-month period with contemporary approaches such as visual pedagogy including videos, pamphlets, live demonstrations, modeling and tell-show-do technique.

Oral health status was reassessed on 15th and 30th day similarly as done on the 1st day. Parents were asked to refill the same questionnaire again on the 30th day.

**Results**

The study population comprised children with autism of age group of 6–18 years (mean age 11 ± 4.51) with a male female ratio of 2.1:1. Mean values of OHI-S (0.035) and plaque index (0.005) decreased significantly when powered toothbrush was used with calcium sucrose phosphate-based formulation — Enafix [Figure 2]. From the data obtained in our study, it was noticed that children on high cariogenic diet had higher DMFT/deft scores. However, after a period of 1-month where continuous monitoring of the diet as well as oral hygiene measures was done, caries score remained the same as before (constant DMFT/deft [3.55]). Parent’s perception element required for maintaining good oral hygiene (tooth brushing frequency, tooth brushing method, duration of brushing, etc.) was seen to improve significantly as shown in Figure 3.
Discussion

There is sparse literature on oral health status of children with autism in developing countries. Providing oral care to children with autism requires patience and a thorough understanding of the patient’s degree of mental disability. Studies indicated higher incidence of caries and periodontal diseases because of reduced access to care and difficulty in daily oral care maintenance. Powered toothbrushes, which are easy to handle, require lesser manual efficiency, and facilitate effective tooth cleaning either used by the child or assisted by the parents/caretaker, are very helpful. Powered toothbrushes when compared to manual toothbrush have the potential to improve oral hygiene by achieving plaque reduction as evident in our study after 30 days.

Parent questionnaire records showed that these children required very obvious physical assistance while performing their daily activities including tooth brushing. Repeated oral hygiene instructions not only improved oral health status of these children but also had marked impact in creating awareness among parents toward oral health of their kids and instilled positive dental attitude in these parents. Due to poor swallowing, reflex toothpaste might be swallowed which can in turn result in fluoride toxicity. Low fluoridated toothpaste with increased frequency has therefore been recommended in the present study to maximize its topical effect and reduce the chances of toxicity in accordance with American Academy of Pediatric Dentistry Guideline on Fluoride Therapy.

Poor masticatory abilities coupled with pouching of food lead to higher incidence of demineralization. This demineralization process can be reduced or reversed by effective mechanical cleansing via a toothbrush and dentifrice. The “anticay” mechanism of calcium sucrose phosphate as used in this study quickly breaks down to release calcium and phosphate ions into the saliva. It has the common ion effect wherein the rate of remineralization increases as it not only remineralizes the surface enamel but also at depth. Anticay is a mixture of calcium salts of sucrose phosphate esters, complexed with inorganic calcium orthophosphate. It is composed of 10–12% calcium and 8–10% phosphorous by weight. Calcium and phosphate in aqueous medium tend to form insoluble precipitates, where from these ions rapidly adsorb on enamel surface, and thereby inhibit demineralization. The widespread influence of calcium and phosphate in biological systems means that this simple property of solubility makes Anticay extremely useful in a large number of therapeutic settings.

Conclusion

This study can be considered as the pioneer study to compare the efficacy of calcium sucrose phosphate-based dentifrice and low fluoride dentifrice to maintain a low DMFT as literature does not cite the comparative effects of cariostatic activity of both. Calcium sucrose phosphate dentifrice with powered toothbrush in children lacking manual dexterity can be used as a better alternative to low fluoridated dentifrice formulations.

However, the conclusion drawn in the present study needs to be further assessed by in vitro and in vivo studies on an elaborate sample to evaluate the effect on inhibition of demineralization, enhancement of remineralization potential, microhardness, and various other parameters when coupled with a manual or powered toothbrush.

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Conflicts of interest

There are no conflicts of interest.

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