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Evaluation of visual pedagogy teaching method for improving oral hygiene practice in children with Autism: An interventional study

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Abstract:

BACKGROUND: Evaluation of visual pedagogy teaching method for improving oral hygiene practice in children with Autism: An interventional study**:** Visual pedagogy is a relatively newer approach to improve dental care in autistic children. The present study aimed to evaluate visual pedagogy in the practice of oral hygiene in autistic children.

MATERIALS AND METHODS: This interventional and prospective study was conducted in the Department of Paediatric and Preventive Dentistry. Required approval was obtained from Institutional Ethical Board. Written informed consent was obtained from parents/caregivers. The age range was 5–12 years which included 100 participants (40 males and 60 females). Improvement of oral hygiene was evaluated by recording the tooth brushing technique and ability to follow instructions as presented in the educational video shown on smartphones with Wi-Fi/mobile data. Inclusion criteria: (1) Accessibility and (2) Age range between 5 to 12 years. Exclusion criteria: (1) Non-cooperative children, (2) Children receiving medicines that influence oral health, and (3) Inability to follow-ups. Fones technique was used for brushing teeth in video recording demonstrating it in simple structured steps. Statistical analysis was performed using Chi-square and Independent t tests.

RESULTS: Statistically significant improvement was observed in oral hygiene (plaque index) after training patients with visual pedagogy.

CONCLUSION: In the present study, the use of visual pedagogy showed improvement in the oral hygiene scores of autistic children.

Keywords:

Autism, hygiene, oral, pedagogy, plaque, visual

Introduction

Children suffering from disorders of the autistic spectrum routinely exhibit fear along with anxiety while undergoing any type of dental management. This manifests as a difficult type of behavior along with uncooperative behavioral reactions.[1,2] There is a specific behavioral profile in children with autism.[3,4]

Children suffering from autism spectrum disorders (ASD) often demonstrate prominent behavioral characteristics such as high aggressiveness, deficient attention, and unresponsiveness along with a few other associated medical problems that can hinder the plan of dental therapy.[1] Additionally, the terminology of "autism spectrum condition" (ASC) has been used for emphasizing the medical diagnosis associated with learning as well as

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differences in thought patterns among the affected children.[5]

It has been consistently observed that oral and dental health status in children suffering from autism spectrum diseases is poorer when compared with normal children. This may attribute to a lack of awareness among the affected children's caregivers' knowledge and difficulty to access dental care services.[6,7]

Any type of communication between an autistic child and the dental personnel in a clinical setup may be difficult and restricted as there is a lack of any standardized protocol as to how to manage such children while performing dental treatment.[8]

Therefore, the treating dentist should attempt to find newer methods related to communication, management of patient behavior as well as pharmacological therapy for controlling such children.[9,10]

Alteration in behavior among children suffering from autism and the habit of causing self-injury may increase the risk of nonresponsive behavior and cause self-trauma during any dental procedure. This prevents any dentist from providing comprehensive treatment. Hence, in these clinical scenarios, dentist may be prompted to employ aggressive tools, for example, Protective Stabilization or Papoose board, and sometimes, even general anesthesia.[6] However, these procedures or tools may not be acceptable to patients or their caregivers, thus creating behavioral issues in dental setups.

Hence, the use of training employing audiovisual tools is advocated for patients who suffer from autism spectrum disorders or conditions. This will help in managing their behavior, thus allowing the treating dental specialist to provide treatment properly and comprehensively.

Visual pedagogy is routinely employed as a conventional approach to manage autistic children in dental settings. Visual pedagogy can be performed by using printed matter, for example, stories around dental treatments and using colored illustrated books regarding oro-dental treatment. The use of such visual aids may assist both parents and children in adapting in a fast and efficient manner to the clinical environment.[11,12]

Also, digitalized visual pedagogy-related materials that include mobile phones, and iPad application tools, for example, the çATED app and Picture Exchange communication system (PECS) have been observed to have a greater impact on these children when compared with printed aids.[13-16]

Albhaisi *et al*. (2022)[17] in their systematic review reported a significant improvement in patient reactions during fluoride application treatment by making use of printed matter for visual training.

Similarly, Isong *et al*. (2014)[18] demonstrated that the use of video-based materials, for example, video goggles, DVDs, and modeling resulted in an improvement in average scores in anxiety and behavioral scales.

Thus, the present interventional study aimed to evaluate visual pedagogy for oral hygiene practice in children with autism.

Materials and Methods

Study design and setting

This interventional prospective study was performed in the Department of Paediatric and Preventive Dentistry in 2021.

Study participants and sampling

Written and signed informed consent was obtained from the children's parents and/or caregivers. The age group selected for the study was 5 to 12 years. A total of 100 participants of which 40 were males and 60 were females were selected for the study.

Assessment of improvement in oral hygiene practice

Any improvement in oral hygiene was evaluated by recording improvements in the technique of tooth brushing and the ability of a particular autistic child in comprehending and following instructions as demonstrated in the educational video. The selected children volunteers who had been diagnosed to be suffering from autism spectrum disorder (ASD) were attending a school for special children. The basic study requirement was the availability or accessibility of a smartphone that had a Wi-Fi or mobile data connection.

Inclusion criteria: (1) Smartphone accessibility and (2) Age range of study participants must be between 5 and 12 years. **Exclusion criteria:** (1) Uncooperative children; (2) Children who were receiving medications that might affect oral health; and (3) Inability to come for follow-up oral examination.

Oral hygiene technique

For standardizing the protocol for oral hygiene, Fones's technique which uses horizontal scrubbing motion on occlusal surfaces was employed as the standard technique for brushing teeth. Fones's tooth brushing technique has been commonly found to be useful in young autistic children as they have limitations in manual dexterity and coordination in motor movements.[19] Apart from brushing teeth, the Fones technique produces gingival stimulation, thus improving overall tissue health.[20]

Demonstration in recorded video with Fones brushing method demonstrated simple as well as structured steps in

the process: a) Filling of mug/glass with water, b) Applying toothpaste over the toothbrush, c) Demonstration of circulatory movement of tooth brushing, d) Motion shown in circles in right-ward and the left-sided directions. First, brush the upper teeth, then the lower teeth, followed by cleaning the inside surfaces, rinsing, and then spitting.

Accompanying audio was recorded in two languages English and local language. The video was mixed, edited as well as modified in MP4 format by checking its compatibility with Android as well as Apple-manufactured smartphones.

The study protocol that was followed included the first assessment of baseline oral hygiene status as per the World Health Organization (WHO) Oral Hygiene Status 2013. Plaque index as per Loe and Sillness was recorded along with frequency, type of toothpaste used, and technique of tooth brushing.

The video was demonstrated to selected children along with their parents, caregivers, and/or teachers both at the baseline stage before starting the intervention. All the children were instructed to use regular toothbrushes and toothpaste which they were using previously. Also, formal training was given to the parents for recording the changes in the method of brushing their teeth before evaluating the follow-up.

Data collection tool and technique

Assessment of plaque index score

Plaque index scores were evaluated by running the tip of the explorer over labial as well as lingual tooth surfaces of six index teeth. Follow-up for evaluating changes or alterations in the method of tooth brushing was performed after one day, on the 14th day as well as the 30th day. Assessment of plaque index was done at baseline and on the 30th day of the beginning of the intervention.

The children's caretakers or parents or teachers were instructed not to cause any modifications in the method of tooth brushing as taught in the demonstrated video. However, the children's supervisors were requested to help in reinforcing various steps as shown in the video from time to time.

Evaluation of the ability of tooth brushing

The ability to brush teeth was assessed using the following criteria: a) Children with a habit of brushing twice daily and b) Children requiring assistance at the time of brushing their teeth.

The history of dental treatment in the studied children was divided into a) Children with a previous history of dental treatment and b) Children who were already under dental treatment.

Statistical analysis

Recorded data were entered in a Microsoft Excel spreadsheet and analysis was done by employing the tool Statistical Package for Social Sciences (SPSS) version 21. All categorical variables were recorded as absolute and relative frequencies, while all continuous variables were recorded in the form of mean values and standard deviation. All graphs were made using Microsoft Excel 2007.

The normality of continuous variable data was analyzed using the "Shapiro–Wilk" test. All data were observed as "normal." Inferential statistical analysis was performed by making use of parametric statistical tests of significance.

Comparison between categorical variables was performed by using the "Chi-square test." Intergroup comparison of continuous variables was performed by employing the Independent t test. The level of statistical significance was then set at 0.05.

Ethical consideration

The ethical clearance for the study was obtained from the concerned Institute's Ethical Reviewer Board committee (IEC/PD/2020EC).

Result and Observations

Demographic characteristics

The age range of studied patients was found to be 5 to 12 years. In analyzing the gender-wise distribution, there were 40 male and 60 female participants. The average age of studied male patients was found to be 9.5 ± 0.25 years while of female autistic patients was observed as 8.9 ± 0.22 years. All selected children were diagnosed with "Autism Spectrum Disorder previously" [Table 1 and Graph 1].

Assessment of oral hygiene status

(1) Average brushing time: The mean + SD time (in minutes) taken by male patients was found to be 1.09 + 0.78 while in female patients was 1.99 + 0.67. In comparison, a *P* value of 1.0 (nonsignificant) was obtained [Table 2 and Graph 2].

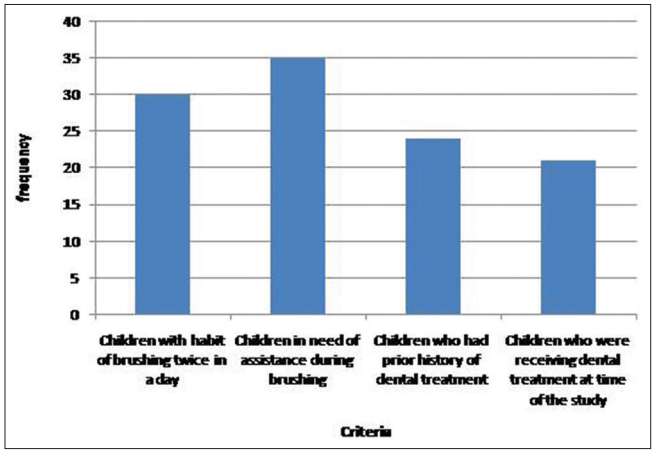
(2) Plaque index scores: The baseline scores in male and female patients were 2.08 + 0.01 and 1.98 + 0.05, respectively. *P* values were found to be nonsignificant ($P = 1.0$) on comparing baseline scores. On follow-up, the mean + SD values of plaque index scores were 0.23 + 0.05 and 0.19 + 0.12 in male and female autistic patients, respectively. On comparing the follow-up scores, a nonsignificant *P* value ($P = 0.07$) was obtained [Table 2].

Table 1: Table showing descriptive data and base-line statistics

	Frequency	Percentages
Gender	40 (males); 60 (females)	40%, 60%
Children with a habit of brushing twice a day	30	30%
Children in need of assistance during brushing	35	35%
Children who had a prior history of dental treatment	24	24%
Children who were receiving dental treatment at the time of the study	21	21%

Table 2: Table showing oral hygiene status in autism-affected children

Oral hygiene criteria	Mean + S.D. (standard deviation)	*P*
Brushing time in minutes (mean+SD) taken by the study participant	1.09+0.78 (males); 1.99+0.67 (females)	1.0
Plaque index scores	2.08+0.01 (males)	1.0
a) Baseline scores	1.98+0.05 (females)	
b) At follow-up	0.23+0.05 (males)	0.07
	0.19+0.12 (females)	



Graph 1: Graph showing descriptive data from autistic children

However, on comparing baseline scores with follow-up plaque index scores, statistical significance was seen, i.e., $P = 0.05$ and 0.04, respectively.

Discussion

Autism spectrum diseases comprise various neurodevelopmental origin disorders which persist throughout the patient's life. It can be defined as a significant hindrance in social interactions as well as abilities to communicate due to unusual, stereotyped, and repetitive types of behaviors. The learning capacities of affected individuals may vary from talented to severely challenging ones. These conditions are usually diagnosed in an early period of childhood. All associated symptoms get manifested by the age of 2 to 3 years. Autism spectrum disorders (ASDs) can affect any individual regardless of race, ethnicity as well as a socioeconomic group. Autism and similar neurological disorders have been found to affect male subjects four times when compared to females.[21,22]

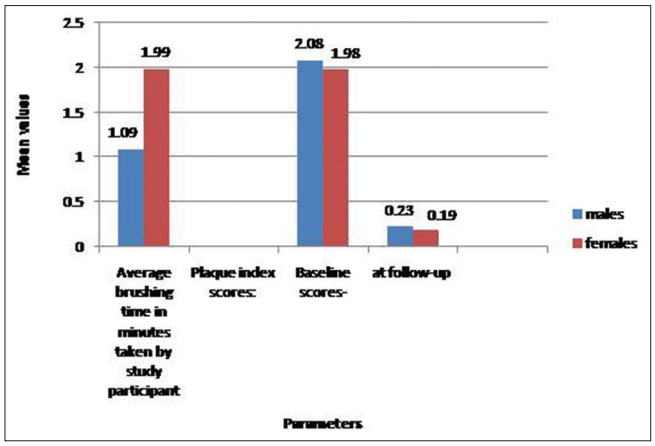
Children diagnosed with autism suffer from various dental health-related issues, for example, dental caries, periodontal diseases, oral microbial alterations, disorders of tooth eruption as well as trauma. Lack of coordination in movements of the tongue may cause food lodgment within the oral cavity as it cannot be swallowed easily. The oral dental disease gets increased by one's habit of consumption of cariogenic food items as there will be a rise in the incidence of dental caries in these children.

Patients who are diagnosed with autism have a similar requirement for dental treatment when compared with the rest of the population. However, their treatment needs are generally unmet due to challenges in managing such patients. It has been seen that approximately 8% to 12% of autistic children do not receive dental treatment when compared with roughly 5% of normally growing children.[23]

An important intervention based on the sensory function that has been used in children diagnosed with autism is the use of mobile or smartphone-based applications. Some applications have been designed especially for smartphones using software designing. The use of such software applications helps in improving society as well as lifestyle-based skills in children with autism disorder.

Cirio (2022)[24] opined that successful dental healthcare for autistic children has the requirement of close cooperation and a good relationship between parents and dentists. One must try to reduce the waiting time for autistic children before treatment. Also, all appointments must include short-timed treatment procedures. Maintaining dental as well as oral health status in children suffering from autism reduces morbidity in these patients. Autistic children very commonly exhibit aggression in their behavior during any treatment procedure on the dental chair. This can inhibit, alter as well as result in decreased accessibility to oral health care in children who are diagnosed with autism.

This group of children must be thus trained using special audiovisual aids for helping them in maintaining their oral health. The use of visual pedagogy methods remains an important tool in training these especially disabled children toward performing basic personal hygiene tasks such as tooth brushing, bathing, changing clothes, etc.



Graph 2: Graph demonstrating oral hygiene status in autistic children and time of brushing

In the present study, the mean age of male patients was observed to be 9.5 ± 0.25 years, while in female patients, it was found to be 8.9 ± 0.22 years.

On analyzing the plaque index (PI) scores, it was seen that baseline Pl scores in male and female patients were 2.08 + 0.01 and 1.98 + 0.05, in a respective manner that was statistically nonsignificant (P = 1.0). On subsequent follow-up, mean + SD plaque index scores were 0.23 + 0.05 in male and 0.19 + 0.12 in female patients that on statistical comparison were found to have no significance (P = 0.07). On comparing baseline scores with follow-up plaque index scores, statistically significant probability values were obtained, i.e., P = 0.05 and 0.04, respectively.

Hence, in the present study, it was found that training using visual pedagogy aids significantly resulted in an improvement in oral health status in the studied population. Our findings are in accordance with other investigators in this field of study.[17,18]

In accordance with our study, Piraneh (2022)[25] in their quasi-randomized controlled clinical trial made a comparison between story-related tooth-brushing educational method with modeling using video over oral hygiene They concluded that intervention using educational video on brushing of teeth improved oral hygiene in Autistic children when compared to traditional storytelling.

Similarly, Popple *et al*. (2016)[26] in their study reported significantly greater efficiency in acquiring the correct method of brushing using the remodeling technique in video format when compared with traditional methods of printed material.

Cirio *et al*. (2022)[27] evaluated the effectiveness of both video and photograph (pedagogical tools) and concluded that the behavioral intervention through visual aids should be used as a strategy to prepare patients with ASDs for their first dental examination.

Pagano *et al*. (2022)[28] developed a software called paINTeraction and concluded that with the use of this digital technology tool, the autistic child can explore the dental office before the real dental visit, thus connecting to the dental professional, achieving greater compliance and reducing anxiety.

Limitation and recommendation

Hence, the major limitations of the study were the small sample size and exclusive use of visual methods rather than spending personal care during the training period. Hence, it is recommended that direct training on a personal level along with the use of visual pedagogy can help these subjects in mastering basic life skills more efficiently than restricting the use of educational videos on mobile phones.

Conclusion

Autism is a disability that affects the neurological system and hampers functioning in daily life. Training these affected patients can significantly help them in maintaining their oral health namely periodontal health and the incidence of dental caries is much reduced. In the present study, it was observed that the use of visual pedagogy significantly improved the oral health of these autistic children.

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Conflicts of interest

There are no conflicts of interest.

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