

# Novel Design Toothbrush for the Children with Cerebral Palsy - A Questionnaire Study

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**Abstract:** Background: *Aim: To evaluate parental acceptance of novel design toothbrush in children with cerebral palsy. Materials and methods: A Total of 24 children aged 5 to 10 years from Sandeep special school, Sullia pre-diagnosed with spastic type of cerebral palsy were included in the study. Written informed consent was obtained from the parents of the included children and permission was sought from the principal of the special school. A Novel design toothbrush was made by modifying manual toothbrush in which a different cartoon stress ball was placed around the handle of toothbrush for better and easy grasp of the brush. Parental acceptance was assessed with help of questionnaire post 1 week after the use of the novel toothbrush. All the readings were entered and subjected to statistical analysis. Results: Overall good parental and child acceptance, better removal of debris and good handle grip was seen with novel design toothbrush and was statistically significant. Conclusion: Novel design toothbrush has various advantages because of its attractive and user - friendly made with soft texture different cartoon stress ball and has better grip which will help in improving the oral hygiene status of children with cerebral palsy.*

**Keywords:** cerebral palsy, novel design toothbrush, oral hygiene,

## 1. Introduction

Oral disease represents a major health problem among individual with disabilities. The prevalence and severity of these diseases are much higher as compared to general population.

Poor oral hygiene is observed in the special children due to the reduced physical and mental abilities of these individuals and consequent difficulties in tooth brushing also poor communication skills, diminished motor skills, the cariogenic effect of medicines with high sugar content, and parents having difficulty in carrying out regular oral hygiene measures.

Cerebral palsy is the most common disability of childhood that affects motor function as a result of injury to the developing brain with average frequency of 2.08 per 1000 live births.

Children with Cerebral palsy is particularly vulnerable and often exhibit poor oral health and systemic health consequences as a direct result of their disability. These difficulties remain throughout the patient's life, presenting problems with general self - care and oral health maintenance

In cerebral palsy spasticity occurs due to damage to the brain during infancy, preterm birth, or birth asphyxia. This affects both neurological and musculoskeletal systems of the body producing symptoms such as abnormal contraction of muscles, postural changes, and movement and activity limitation which are accompanied by sensory disturbances along with perceptual disorders, cognitive issues, inability to communicate, behavioral issues, epilepsy, and secondary musculoskeletal problems.

Spastic - type Cerebral palsy have increased muscle spasticity, predicting higher caries prevalence of 64% in Asia. This may be due to involuntary muscle movement obstructing

oral hygiene and treatment. In support, it was also found that spastic Cerebral palsy children have limited and acidic salivary flow, increasing risk of caries and oral disease.

Inadequate toothbrushing frequency was found to be a significant risk factor affecting caries experience in Cerebral palsy children. This has been attributed to compromised orofacial motor dysfunction, lack of muscle grip, manual dexterity, decreased intraoral sensitivity and also difficulty in relaxing their jaw muscles making it hard to hold a toothbrush or floss so they are highly dependent on their caregivers to perform daily oral hygiene measures.

Brushing of teeth reduces the risk of accumulation of food particles, plaque which is the main reason for occurrence of dental caries. Therefore, there is a need of attractive and user - friendly tooth brushes with soft texture and better grip which will help in improving the oral hygiene status of children with cerebral palsy.

Hence, the study aimed to evaluate the parental acceptance of novel toothbrush in children with cerebral palsy.

## 2. Materials and Method

A Total of 24 children aged 5 to 10 years from Sandeep special school, Sullia pre-diagnosed with spastic type of cerebral palsy were included in the study.

A single calibrated dentist examined all the children under sunlight. Written informed consent was obtained from the parents of the included children and permission was sought from the principal of the special school.

A Novel design toothbrush was made by modifying manual toothbrush in which a different cartoon stress ball (fig 2) was placed around the handle of toothbrush for better and easy grasp of the brush (fig 3).

Tooth brushing technique (Scrub) was demonstrated to the parents and the children through models and their compliance to the instructions were checked by asking them to demonstrate the same. All the participants were instructed to do tooth brushing twice daily (morning and night) for 3 minutes with fluoridated toothpaste.

A pea sized toothpaste was instructed to be used by the participants and swish their mouth with water after tooth brushing.

Parental acceptance was assessed with help of questionnaire in both English and local language (figure1) post 1 week after the use of the novel toothbrush. All the readings were entered and subjected to statistical analysis.

1. Did your child like the new toothbrush?	Score:
2. How was the Feel of the toothbrush?	Score:
3. Does your brush have better Handle and grip?	Score:
4. Does the toothbrush have good accessibility to reach all the tooth surfaces?	Yes/no
5. Any food particles left behind in the child's mouth after brushing?	Yes/no
6. Overall, did the toothbrush provide better brushing experience?	Yes/no
7. Is it different from the old toothbrush?	Yes/no
8. Do you like the novel toothbrush over the old toothbrush?	Yes/no
9. Would you prefer this novel toothbrush over the old toothbrush?	Yes/no
10. Is your child happy to brush twice with this new toothbrush?	Yes/no

1. ನಿಮ್ಮ ಮಗುವಿಗೆ ಹೊಸ ಬೂತ್ ಬ್ರಷ್ ಇಷ್ಟವಾಯಿತೇ?	ಸ್ಕೋರ್:
2. ಹಲ್ಲುಬಿಡುವ ಬ್ರಷ್‌ನ ಭಾವನ ಹೇಗಿತ್ತು?	ಸ್ಕೋರ್:
3. ನಿಮ್ಮ ಬ್ರಷ್ ಉತ್ತಮ ಹ್ಯಾಂಡಲ್ ಮತ್ತು ಗ್ರಿಪ್‌ನ್ನು ಹೊಂದಿದೆಯೇ?	ಸ್ಕೋರ್:
4. ಬೂತ್ ಬ್ರಷ್ ಎಲ್ಲಾ ಹಲ್ಲಿನ ಮೇಲ್/ಗೊಳನ್ನು ತಲುಪಲು ಉತ್ತಮ ಪ್ರವೇಶವನ್ನು ಹೊಂದಿದೆಯೇ?	ಹೌದು/ಇಲ್ಲ
5. ಹಲ್ಲುಬಿಡುವ ನಂತರ ಮಗುವಿನ ಬಾಯಿಯಲ್ಲಿ ಆಹಾರದ ಕಣಗಳು ಉಳಿದಿವೆಯೇ?	ಹೌದು/ಇಲ್ಲ
6. ಒಟ್ಟಾರೆಯಾಗಿ, ಹಲ್ಲುಬಿಡುವ ಬ್ರಷ್ ಉತ್ತಮ ಬ್ರಷಿಂಗ್ ಅನುಭವವನ್ನು ನೀಡಿದೆಯೇ?	ಹೌದು/ಇಲ್ಲ
7. ಇದು ಹಳೆಯ ಹಲ್ಲುಬಿಡುವ ಬ್ರಷ್‌ಗಿಂತ ಭಿನ್ನವಾಗಿದೆಯೇ?	ಹೌದು/ಇಲ್ಲ
8. ನೀವು ಹಳೆಯ ಬೂತ್ ಬ್ರಷ್‌ನ ಮೇಲೆ ಕಾಡಂಬರಿ ಬೂತ್ ಬ್ರಷ್ ಅನ್ನು ಇಷ್ಟಪಡುತ್ತೀರಾ?	ಹೌದು/ಇಲ್ಲ
9. ಹಳೆಯ ಬೂತ್ ಬ್ರಷ್‌ಗಿಂತ ಈ ಕಾಡಂಬರಿ ಬೂತ್ ಬ್ರಷ್ ಅನ್ನು ನೀವು ಬಯಸುತ್ತೀರಾ?	ಹೌದು/ಇಲ್ಲ
10. ಈ ಹೊಸ ಬೂತ್ ಬ್ರಷ್‌ನಿಂದ ನಿಮ್ಮ ಮಗು ಎರಡು ಬಾರಿ ಬ್ರಷ್ ಮಾಡಲು ಸಂತೋಷವಾಗಿದೆಯೇ?	ಹೌದು/ಇಲ್ಲ

Figure 1: Questionnaire to evaluate parental acceptance of novel design toothbrush



Figure 2



Figure 3

### 3. Results

Table 1: Parents perception of children's acceptability of novel toothbrush

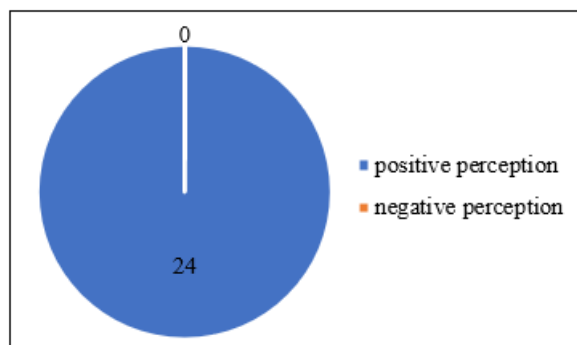
Questions related to	Frequency and percentage of positive acceptance	Mean acceptance scores	P - value
Overall acceptance by child	24 (100%)	1	0.0000000
Feel of the toothbrush	24 (100%)	1.33± 0.48	0.0000000
Handling and ergonomics	24 (100%)	1	0.0000000

P<0.05 is considered as statistically significant

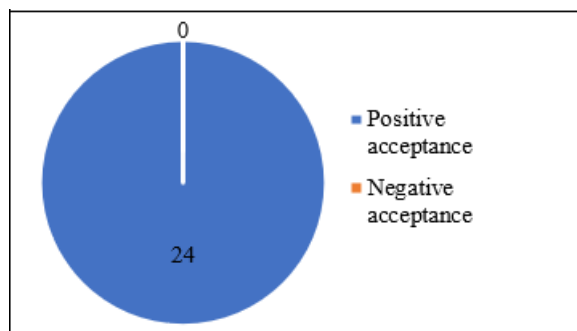
Table 2: Parents acceptance of novel toothbrush among their children

Questions related to	Frequency of positive outcomes	Percentage of positive outcomes	p - value
Accessibility	24	100%	0.0000000
Removal of debris	24	100%	0.0000000
Uniqueness	24	100%	0.0000000
Preference over other brushes	24	100%	0.0000000
Acceptability to use twice a day	24	100%	0.0000000
Overall acceptance by parent	24	100%	0.0000000

P<0.05 is considered as statistically significant



**Figure 1:** Parents perception of children's acceptability of novel tooth brush



**Figure 2:** Parents acceptance of novel toothbrush among their children

#### 4. Discussion

Developmentally disabled children have poor oral health and the main factor related to the gingival and periodontal problems in disabled children is the inadequacy of the plaque removal from the teeth.

Children with Cerebral palsy is particularly vulnerable and often exhibit poor oral health and systemic health consequences as a direct result of their disability. These difficulties remain throughout the patient's life, presenting problems with general self-care and oral health maintenance. These children have higher caries prevalence due to involuntary muscle movement obstructing oral hygiene and treatment.

Since Cerebral palsy patients are dependent on their caregivers their dental caries experience may be largely influenced by socioeconomic circumstances determined by factors such as their caregiver's education, motivation to perform daily oral hygiene and domestic income. Also it was found in other studies that there is decreased awareness among the parents regarding maintenance of oral hygiene as the focus is shifted completely on overall general health leading to ignorance of oral health.

Hence the study evaluated the parental acceptance of novel design toothbrush in children with cerebral palsy.

Inadequate toothbrushing frequency was found to be a significant risk factor affecting caries experience in Cerebral palsy children. This has been attributed to compromised orofacial motor dysfunction, lack of muscle grip, manual dexterity, decreased intraoral sensitivity and also difficulty in

relaxing their jaw muscles making it hard to hold a toothbrush or floss making them completely depend on caregivers.

So, a novel design toothbrush was done by modifying the manual toothbrush in which attractive cartoon stress ball was placed around the handle of toothbrush making it more attractive and user-friendly with soft texture and better grip to help the caregivers to assist the child while brushing and improve their oral hygiene.

Prior to evaluating the parental acceptance, a standardized tooth brushing technique was demonstrated to parents and were asked to brush the child's teeth twice daily to avoid any bias.

Parental acceptance of novel design tooth brush was evaluated with a questionnaire consisting of set of 10 questions given post intervention.

Spastic cerebral palsy children were included in this study because they have a caries prevalence of 64% due to limited and acidic salivary flow, increasing risk of caries and oral disease also they lack manual dexterity and have difficulty in relaxing their jaw muscles which makes it more difficult for them to maintain the oral hygiene and making them depend on their caregivers to perform these procedures.

All the parents liked the novel design toothbrush and acceptance was significantly good. This may be due to the soft texture and better grip of the handle of the toothbrush and they were made attractive using different cartoon stress ball making it more acceptable for the children subsequently making it easy for the parents to perform the routine oral hygiene procedures.

Children also liked the look and feel of the brush and were very happy to be brushed twice daily with the assistance of their parent with this novel design toothbrush.

Overall, this toothbrush provided better brushing experience and better removal of the food particles from the mouth improving the oral hygiene of the child and parents preferred this toothbrush over the older toothbrush because of its attractive appearance, better compliance, better child cooperation and better handle grip.

Hence the novel design tooth brush was very well accepted by the parents as well as children because of its ease of use in maintaining the good oral hygiene resulting in reduction of plaque accumulation and subsequently eliminating one of the main risk factors i. e inadequate toothbrushing leading to caries development.

#### 5. Conclusion

Novel design toothbrush was better than manual toothbrush with various advantages because of its attractive and user-friendly - made with soft textured cartoon stress ball and has better grip for improved oral hygiene status of children with cerebral palsy. Overall good parental and child acceptance, better removal of debris and good handle grip making it good alternative for children with special needs. Further extensive

clinical trials and long - term in vivo studies are required to support this perspective.

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