

Original Article



Effectiveness of Comprehensive Oral Health Program for Caregivers of Children with Special Needs: A Randomized Control Study

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Article Info**Article History:**

Received: April 6, 2025

Revised: September 29, 2025

Accepted: October 6, 2025

ePublished: May 25, 2026

Keywords:

Oral health, Children with disability, Oral hygiene, Health education, Dental diseases

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Abstract

Introduction: Children with disabilities often experience poorer dental health than their typical peers. There is a need for preventive, promotive and treatment programmes to address the oral health disparities faced by children with special needs. This study aims to evaluate the effectiveness of a comprehensive health programme on the knowledge of brushing technique among caregivers and the oral health status of children with disabilities.

Methods: A quantitative approach with a control-group pretest-post-test design was adopted. From July 2023 to September 2023, the study was conducted at Chethana Special School and Spoorti Special School, Karnataka, and caregivers of special children were included. Twenty caregivers were randomly allotted to each of the intervention and control groups. Data were gathered using a demographic Proforma, a structured checklist on brushing technique, and the WHO Oral Health Status Questionnaire 2013. Data were analysed using Jamovi 2.6.26.0 Version.

Results: The present study found that, after the intervention, knowledge of brushing technique among caregivers was significantly higher in the experimental group ($P < 0.001$). Oral health status, including oral health behaviours and dietary habits, showed significant changes ($P < 0.05$) compared to the control group. Consistent educational support contributed to greater caregiver involvement and enhanced oral hygiene practices.

Conclusion: The low pretest knowledge and oral health status scores indicate a lack of awareness regarding dental hygiene practices. Continuous caregiver-oriented oral health education programs, along with visual teaching materials and reinforcement sessions, may help improve long-term oral hygiene practices.

Introduction

Disability refers to an individual with a physical, cognitive, sensory, developmental, behavioural, emotional or intellectual impairment or a restrictive condition that necessitates prompt health care intervention.¹ About 240 million children around the globe are disabled; 1 in 10 globally has a disability. In South Asia, 64.4% of children with disabilities are in the 0-17 years age group.² Children may be born with disability or may acquire one in the future due to other causes. Children, the elderly, those with disabilities, women, and minorities often face social, economic and systemic barriers, requiring timely support and welfare measures.³ The 2019 State of Education Report for India: Children with Disabilities indicates that there are 78,64,636 disabled children in India, which is

1.7 per cent of the total child population.⁴

Dental health is an essential part of overall health and well-being. Good oral health builds self-confidence and facilitates proper communication and self-esteem. Children with special needs experience poorer oral health and more untreated diseases than their typically developing peers due to sensory, developmental, behavioural, physical, and intellectual disabilities.⁵

Dental health is a critical issue; in India, children with disabilities experience high caries prevalence (89.8%), poor dental hygiene, extremely poor oral health and risk for periodontal diseases.^{6,7} Caring for children with intellectual disabilities is most challenging due to physical limitations and uncooperative behaviour.⁸ Children with hearing impairments are affected in terms of general

Research Highlights

What is the current knowledge?

- Children with special needs often have poor oral hygiene, which contributes to dental negligence, and are highly dependent on parents/ caregivers.

What is new here?

- In this study, oral assessment, educational sessions, demonstration of tooth brushing, counselling, and reinforcement were implemented into a unique approach.
- This study also includes pictorial manuals and education in local languages, which is culturally appropriate for a diverse population.
- Implication of the program in community and clinical practice settings by nurses, dental professionals, schools, special educators, and rehabilitation centers.

behaviour and socialisation.⁹ Children with disabilities depend on parents or caregivers to make decisions and perform or monitor their daily activities, oral health care and overall well-being due to mental and /or physical limitations. Consuming sugary foods or beverages, using medication, and limited access to dental care can negatively affect dental health outcomes.^{10,11} Eating behaviours, such as feeding problems and delayed development of feeding skills, also contribute. Social, economic, and family factors such as parental education and occupation, family type, income status, low socio-economic background, and lack of awareness of dental health greatly contribute to the deterioration of oral health.^{12,13}

Children with special needs often have limited access to dental treatment. Their ability to participate in oral care, the cost of dental care, and lack of access to providers can also be contributing factors.^{14,15}

Oral ailments such as caries and inadequate dental care can adversely affect the well-being of both typically developing children and those with special needs. These children are at higher risk of oral conditions such as decayed teeth, poor oral hygiene, dental injuries and trauma, gingivitis and related disorders.^{16,17}

The role of parents and caregivers is crucial in managing the dental health of children with special needs. Parents' knowledge, well-being, and attitudes in providing dental care have a significant impact on children's dental health outcomes.¹⁸ Inadequate knowledge or behaviour regarding oral health may lead to reduced routine care, thereby worsening children's dental health. Factors such as brushing habits, family dietary patterns, and dental visits greatly influence a child's oral health status.¹⁹ Effective oral care for children with special needs depends on empowering and supporting parents through various interventions, including structured parent training, educational sessions, behaviour modification programmes and the use of digital tools and applications, which have proven effective in addressing oral health issues in these

children.²⁰⁻²³

The current evidence specifies that children with disabilities are at greater risk of dental problems, poor oral hygiene and unmet dental care needs because of their limitations in physical, behavioural functions, and their dependence on caregivers. Poor dental hygiene practices, difficulties in accessing dental care and lack of awareness among caregivers are cited in studies.^{24,25} It also shows that comprehensive programs integrating reinforcement, education, demonstration, counselling, support and follow-up remain limited at the community level in this region.²⁶ The planned oral health interventions with continued support among caregivers of children with special needs are limited in community settings in Karnataka. Educational programmes focused on caregivers have revealed improvements in oral dental health outcomes.^{27,28} Hence, this study aims to evaluate the effectiveness of a comprehensive health programme on the knowledge of brushing technique among caregivers and the oral health status of children with disabilities

Methods and Materials

A true experimental pre-test post-test control group design was adopted to assess the effectiveness of the comprehensive oral health programme among caregivers of special children. The study was conducted over two months, from July 2023 to September 2023, in the Dakshina Kannada district, Karnataka.

There are 14 special schools identified in the districts; two schools were randomly selected by lottery: Chethana Special School in the Udupi district and Spoorti Special School in the Dakshina Kannada district, Karnataka. Children with special needs attending these schools were eligible for inclusion if they were aged 6-18 years, had a mild or moderate level of disability as indicated on their disability card, had a primary caregiver (parent or designated caretaker), and if the caregiver provided consent and was willing to participate. Children were excluded if they had a severe and profound degree of disability, comorbid or chronic diseases, dental abnormalities, or if they declined to participate. Based on these criteria, 40 caregiver-child dyads were selected. (Figure 1)

The sample size was calculated based on a previous study,²⁹ which reported pre-test mean of ($\bar{x}_1$) 2.4, with a standard deviation of (s_1) 0.8. post-test mean of ($\bar{x}_2$) 3.0 with a standard deviation of (s_2) 0.9. Considering a potential attrition rate of 20%, a sample size of 16 was estimated for the experimental group with 80% power and 5% alpha level. To account for potential loss to follow-up or variability, the sample size was rounded up to 20 participants. An equal number of participants ($n=20$) were recruited into the control group, to allow for between-group comparisons. The calculation was performed using the Master software, which applies the following formula:

Hence, the total required sample size is: $20 + 20 = 40$

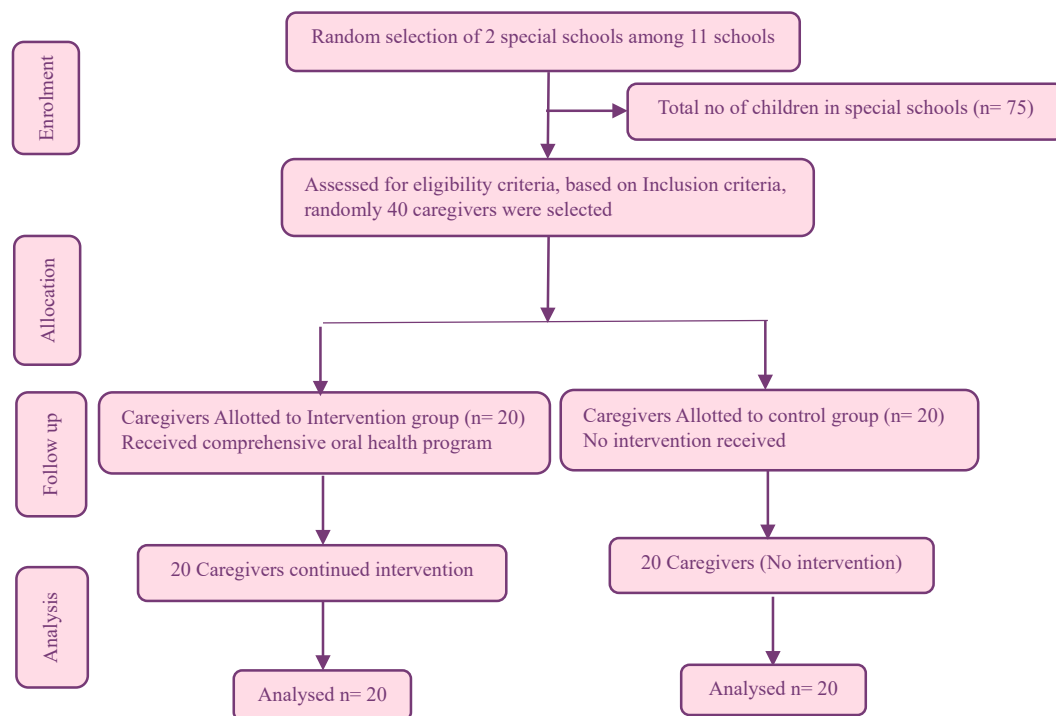


Figure 1. Flow chart of the selection process

Participants who agreed to take part in this study were randomly assigned to either the intervention group or the control group. Allocation was conducted with a 1:1 ratio; caregivers were instructed to select a lottery, with those drawing even numbers assigned to the intervention group, and those drawing odd numbers assigned to the control group. Thus, 40 primary caregivers (mothers, fathers, or designated caretakers) who met the inclusion criteria were selected using simple random sampling, yielding a total sample size of 40 with 20 in each of the experimental and control groups.

Data collection tools: The data collection tools included a Demographic Proforma, a structured checklist on brushing technique and WHO Oral Health Status Questionnaire

Demographic Proforma

The Demographic Proforma was designed to collect vital demographic information about children and their caregivers, which includes the child's and caregiver's age, the child's gender, the caregiver's education and occupation status, and prior knowledge of oral health.

Structured checklist on brushing technique

This tool assessed tooth brushing technique through a series of steps and scores. Parents/Caregivers were required to write the numbers 1 to 9 in sequence to follow the correct steps for tooth brushing. If the numbering for a step is correct, a score of "1" is allotted; for incorrect numbering, a score of "0" is given. A checklist was prepared based on standard oral hygiene practices and a review of the literature. Content validity was established by gaining opinions from various experts. The content validity index

(CVI) of the checklist was 0.81. Reliability of the checklist was established through pilot testing, which confirmed satisfactory consistency. A similar cross-sectional study was conducted among 450 parents to develop and validate the comprehensive Parenting and Child Tooth Brushing Assessment (PACTA) questionnaire. It demonstrated satisfactory reliability and validity with an internal consistency of (>0.7).³⁰

WHO Oral Health Status Questionnaire

³¹ The WHO Oral Health Status Questionnaire is a standardised tool used in epidemiological and community oral health surveys. It is a tool that collects information on oral hygiene practices, risk factors for oral disease, and dietary habits, which evaluates dental visits, reasons for them, and problems with the condition of the teeth and mouth. Scoring was calculated using a rating scale from "0" to "9" for most questions, while a few questions were dichotomous ("Yes" or "No"), with an established reliability of 0.863. It has established construct validity through repeated use among diverse populations. In this study, the tool's validity was confirmed through expert opinion, with a content validity index (CVI) of 0.91. The findings were comparable to a previous study; a validation study of the WHO Oral Health Status Questionnaire for children and adolescents was assessed for validity and reliability. The results showed that the questionnaire is reliable over time and has internal consistency and stability.³²

Data collection and intervention

Phase I: This phase involved screening children with special needs in selected special schools. Socio-

demographic characteristics of the children and their parents or caregivers were collected. Pre-intervention data were assessed using the WHO Oral Health Status Questionnaire 2013, and tooth-brushing skill was assessed with the Modified Tooth Brushing Checklist in both groups.

Phase II: Development of the Health Education Material

A Structured health education material was developed for caregivers of children with neurodevelopmental disorders. The content was designed based on the resource guide (South Carolina Department of Health and Environmental Control, Division of Oral Health),³³ which includes the importance of oral health, care of teeth and gums, brushing techniques, choosing the right brush and toothpaste, healthy nutrition and diet, various positions while brushing, and dental visits, and expert consultation from one Paediatrician, two Paediatric dentists, two special educators, one Nutritionist, and one psychologist. The manual focused on:

1. Oral health and its importance to the human body
2. Healthy oral hygiene techniques,
3. Dietary management,
4. Management of behavioural challenges during dental care,
5. Tips for healthy Dental care.
6. Positions while brushing for children with special needs.
7. Specific dental services.

The manual was validated for content by a panel of seven experts (CVI=0.92). Pilot testing was conducted with 6 caregivers who were not involved in the main study, and necessary modifications were made based on their responses.

Phase III: Intervention and Timeline

The Comprehensive Oral Health Programme was implemented for the experimental group, with each caregiver receiving the intervention over 4 weeks. The first week consisted of an informative session on oral health and its importance for children with special needs. The second session included a live toothbrushing demonstration for 20 parents/ caregivers, using artificial dentures. In the third week, individualised oral counselling was provided in consultation with the dentist based on the oral status, and parents' queries were addressed. In the fourth weekly session, parents were asked to redemonstrate the procedure, instant corrections were made, and pamphlets were distributed for future reference.

Audiovisual aids, such as PowerPoint presentations, flashcards, blackboards, and artificial dentures, were used for the teaching and training sessions. Each session lasted 45-60 minutes. The control group received no intervention to assess natural changes in children's oral health.

Post-intervention

The intervention programme was implemented over 4 weeks, and a post-test was conducted 2 weeks

later, for a total of 6 weeks, to evaluate the impact of the Comprehensive Oral Health Programme in the experimental group. The same tools and procedures were used for data collection to ensure consistency. A post-test was also conducted in the control group with no intervention.

Statistical analysis

The data collected were analysed using descriptive and inferential statistics. Homogeneity of demographic variables was examined. The normality of the data was assessed using the Shapiro-Wilk test, which indicated that the data were not normally distributed. Therefore, a non-parametric test was used for analysis. The Wilcoxon signed-rank test was applied. Data were analysed using Jamovi 2.6.26.0; the level of significance was set at $P < 0.05$. The study was presented and approved by the Institutional Ethics Committee (ACN/2023/OP/OL/0344). Written informed consent from caregivers and assent from the children were obtained before participation. Participant information sheets were provided in English and the local language.

Results

The data show that in the experimental group, the mean (SD) age of children was 12.5(2.91), whereas for caregivers, it was 37.65(4.98), with a higher representation of males (55%) among children. A major portion of Primary caregivers completed only primary education (40%), with caregivers largely being homemakers (70%), and only (25%) knew about oral health. In the control group, the mean age of children was 12.8(2.93), whereas for caregivers, the mean age of caregivers was 38.2(5.72). With an equal representation of males and females. A major portion of Primary caregivers completed only secondary education (40%), and (50%) caregivers were largely homemakers; only (15%) were aware of oral health. (Table 1)

Table 2 and Table 3 evaluates the effectiveness of Dental education and live demonstration on tooth brushing, The data represent median scores and interquartile ranges (Q1, Q3) for pre-intervention 4(3, 4) and post-intervention 7(6,8.75) in experimental group shows improvement, whereas in control group pre intervention 4(4, 5) and post intervention 4(3.25, 5) indicating no significant changes. Statistically significant changes ($P < 0.001$) were observed in the experimental group, indicating the intervention's effectiveness, whereas no significant changes were observed in the control group.

Table 4 evaluates the effectiveness of the Comprehensive Oral Health Program on oral health. The results in the intervention group showed significant improvements in perceived health and gum health, suggesting increased awareness and potential behavioural changes that led to better oral hygiene. Additionally, improvements were noted in cleaning habits and in dental problems experienced in the past year. Psychological aspects also showed positive changes, with children reporting less

Table 1. Demographic characteristics of the participants

Demographic variables	Frequency (%)				Total (n = 40)
	Experimental group (n = 20)		Control group (n = 20)		
Caregiver's age (in years)					
31-40	8(40)	37.65(4.98)	11(55)	38.2(5.72)	19(47.5)
41-50	12(60)		9(45)		21(52.5)
Age of the child (in years)					
6-10	4(20)		3(15)		7(17.5)
11-14	8(40)	12.5(2.91)	8(40)	12.8(2.93)	16(40.0)
15-18	8(40)		9(45)		17(42.5)
Gender of the child					
Male		11(55)		10(50)	21(52.5)
Female		9(45)		10(50)	19(47.5)
Education status of care givers					
Primary		8(40)		5(25)	13(32.5)
Secondary		5(25)		8(40)	13(32.5)
Higher secondary		4(20)		6(30)	10(25)
Graduate and above		3(15)		1(5)	4(10)
Occupation of the caregiver					
Govt Employee		0		1(5)	1(2.5)
Private Employee		2(10)		5(25)	7(17.5)
Self-Employee		4(20)		4(20)	8(20)
Home maker		14(70)		10(50)	24(60)
Knowledge regarding oral health					
Yes		5(25)		3(15)	8(20)
No		15(75)		17(85)	32(80)
If yes, Source of information					
Mass media		10(50)		9(45)	19(47.5)
Health professional		4(20)		4(20)	8(20)
Others		6(30)		7(35)	13(32.5)

Table 2. Median scores on knowledge of brushing technique between the experimental and control groups (n = 40)

Oral health knowledge	Median (Q1, Q3)	Wilcoxon-signed rank test value	P value
Control group			
Pre-test	4(4, 5)	0.26	0.80
Post-test	4(3.25, 5)		
Experimental group			
Pre-test	4(3, 4)	3.90	<0.001*
Post-test	7(6, 8.75)		

*P<0.05, statistically significant, Wilcoxon signed rank test

Table 3. Comparison of tooth brushing knowledge between the post control and post experiment group (n = 40)

Oral Health Knowledge	N	Median (Q1, Q3)	Wilcoxon-signed rank test value	P value
Control post-test	20	4(3.25, 5)	3.76	P<0.001*
Experiment post-test	20	7(6, 8.75)		

*P<0.05, Statistically significant, Wilcoxon signed rank test

Table 4. Median scores of oral health behaviours and dietary habits: comparison of experimental pre and post intervention

Oral health assessment questionnaire	N	Median (Q1, Q3)	Wilcoxon- signed rank test value	P value
Health of Teeth				
Exp. Pre	20	5(4.25, 5.75)	3.23	<0.001*
Exp. Post	20	3(3, 4)		
Health of Gums				
Exp. Pre	20	5(4, 5)	3.00	0.003*
Exp. Post	20	4(4,5)		
Discomfort				
Exp. Pre	20	2(2,3)	1.00	0.32
Exp. Post	20	2(2,3)		
Visit to Dentists				
Exp. Pre	20	2(2,3)	1.72	0.08
Exp. Post	20	2(2,3)		
Reason for the last visit				
Exp. Pre	20	3(2,3)	1.13	0.26
Exp. Post	20	3(2,3)		
Cleaning				
Exp. Pre	20	3(2,4)	2.46	0.01*
Exp. Post	20	4(2.25, 5)		
Problems faced during the past year				
Tooth Appearance				
Exp. Pre	20	1.50(1, 2)	3.16	0.002*
Exp. Post	20	1(1,1)		
Avoid smiling and laughing				
Exp. Pre	20	2(1,2)	2.45	0.01*
Exp. Post	20	1(1,2)		
Children make fun of teeth				
Exp. Pre	20	2(2,2)	2.00	0.05*
Exp. Post	20	2(1,2)		
Discomfort caused				
Exp. Pre	20	1(1,2)	1.73	0.08
Exp. Post	20	1(1,1.75)		
Difficulty in biting hard food				
Exp. Pre	20	1(1,2)	1.73	0.08
Exp. Post	20	1(1,1)		
Difficulty in chewing				
Exp. Pre	20	1(1,1.75)	2.00	0.05*
Exp. Post	20	1(1,2)		
Eat fresh fruits				
Exp. Pre	20	4(4,5.75)	1.69	0.09
Exp. Post	20	4(3.25, 4.75)		
Eat Biscuits, cakes				
Exp. Pre	20	5(4.25, 5)	2.91	0.004*
Exp. Post	20	4(3.25, 5)		
Drink Lemonade, Coca Cola				
Exp. Pre	20	4.50(3.25, 5)	2.13	0.03*
Exp. Post	20	4(3, 5)		

Table 4. Continued

Oral health assessment questionnaire	N	Median (Q1, Q3)	Wilcoxon-signed rank test value	P value
Eating Jam/honey				
Exp. Pre	20	5(3.25, 5.75)	2.23	0.03*
Exp. Post	20	4(3, 5)		
Eating chewing gum				
Exp. Pre	20	1(1, 2)	1.73	0.08
Exp. Post	20	1(1, 2)		
Eating sweets and candy				
Exp. Pre	20	4(3, 5)	2.26	0.02*
Exp. Post	20	3.50(3, 4)		
Drinking milk with sugar				
Exp. Pre	20	5(3.25, 6)	2.41	0.02*
Exp. Post	20	4(3, 5)		
Drinking tea with sugar				
Exp. Pre	20	2.50(1, 5)	1.59	0.11
Exp. Post	20	2(1, 3.75)		
Drinking Coffee with sugar				
Exp. Pre	20	1(1, 4)	1.41	0.16
Exp. Post	20	1(1, 4)		
Eating Rice and rice products				
Exp. Pre	20	5(5,5.75)	2.00	0.05
Exp. Post	20	5(5,5)		
Eating fried and processed food				
Exp. Pre	20	5(3,6)	1.30	0.05
Exp. Post	20	4.50(3.25, 5)		

* $P < 0.05$, Statistically significant, Wilcoxon signed rank test

avoidance of smiling/laughing and fewer instances of being made fun of due to dental issues.

Regarding dietary habits, there was a significant reduction in the consumption of sugary foods and beverages, including biscuits and cakes, lemonade and soft drinks, sweets and candy, jam/honey, and milk with sugar. This indicates a positive shift in dietary choices that support better oral health. Additionally, a reduction in chewing difficulties was observed, potentially linked to improved dental awareness and hygiene. However, some behaviours, such as discomfort, difficulty biting hard foods, use of chewing gum, and intake of fried/processed foods, did not show significant changes ($P > 0.05$), indicating areas where further reinforcement is needed.

Table 5 shows that in the control group; dental health showed a slight decline in median score from pre- to post-assessment. For all other categories, including gum health, discomfort, dental visits, and reasons for the last visit, and oral hygiene behaviours, there were no statistically significant differences between pre- and post-assessment scores. This suggests that there was no noticeable improvement in oral health perceptions, dental visits, or dietary habits among children in the control group. Regarding dietary behaviours, there were

Table 5. Median scores of oral health behaviours and dietary habits comparison between experimental and control group post intervention (n = 40)

Oral health assessment questionnaire	N	Median (Q1, Q3)	Wilcoxon-signed rank test value	P value
Health of Teeth				
Exp. Post	20	3(3,4)	2.30	0.02*
Con. Post	20	5(4,5)		
Health of Gums				
Exp. Post	20	4(4,5)	0.53	0.60
Con. Post	20	5(4,5)		
Discomfort				
Exp. Post	20	2(2,3)	1.67	0.10
Con. Post	20	2(2,2)		
Visit to the Dentists				
Exp. Post	20	2(2,3)	0.30	0.76
Con. Post	20	2.50(1.25, 3)		
Reason for the last visit				
Exp. Post	20	3(2,3)	1.41	0.16
Con. Post	20	2(2,3)		
Cleaning				
Exp. Post	20	4(2.25, 5)	2.39	0.02*
Con. Post	20	2.50(2,4)		
Problems during the past year				
Tooth Appearance				
Exp. Post	20	1(1,1)	3.74	<0.001*
Con. Post	20	2(1,2)		
Avoid smiling and laughing				
Exp. Post	20	1(1,2)	0.33	0.74
Con. Post	20	1.50(1,2)		
Children make fun of teeth				
Exp. Post	20	2(1,2)	1.41	0.16
Con. Post	20	1(1,2)		
Discomfort caused				
Exp. Post	20	1(1,1.75)	1.34	0.18
Con. Post	20	1(1,2)		
Difficulty in biting hard food				
Exp. Post	20	1(1,1)	1.00	0.32
Con. Post	20	1(1,2)		
Difficulty in chewing				
Exp. Post	20	1(1,2)	1.89	0.06
Con. Post	20	1(1,1)		
Eat fresh fruits				
Exp. Post	20	4(3.25, 4.75)	0.52	0.60
Con. Post	20	4(3, 5.75)		
Eat Biscuits, cakes				
Exp. Post	20	4(3.25, 5)	1.98	0.05*
Con. Post	20	5(4.25, 6)		
Drink Lemonade, Coca Cola				
Exp. Post	20	4(3,5)	0.37	0.72
Con. Post	20	4(2.25, 5)		

Table 5. Continued

Oral health assessment questionnaire	N	Median (Q1, Q3)	Wilcoxon-signed rank test value	P value
Eating Jam/honey				
Exp. Post	20	4(3,5)	1.15	0.25
Con. Post	20	4(2.25, 5.75)		
Eating chewing Gum				
Exp. Post	20	1(1, 2)	2.807	0.005*
Con. Post	20	2(1, 2.75)		
Eating sweets and candy				
Exp. Post	20	3.50(3,4)	1.91	0.06*
Con. Post	20	4(3,5)		
Drinking milk with sugar				
Exp. Post	20	4(3,5)	2.68	0.007*
Con. Post	20	5(4,6)		
Drinking tea with sugar				
Exp. Post	20	2(1,3.75)	2.44	0.02*
Con. Post	20	4(2,5)		
Drinking coffee with sugar				
Exp. Post	20	1(1,4)	2.41	0.02*
Con. Post	20	3(1,4)		
Eating rice and rice products				
Exp. Post	20	5(5,5)	0.99	0.32
Con. Post	20	5(5,5)		
Eating fried and processed food				
Exp. Post	20	4.50(3.25,5)	1.10	0.27
Con. Post	20	4.50(3.25,5.75)		

* $P < 0.05$, Statistically significant, Wilcoxon signed rank test.

no significant changes in the consumption of sweets, carbonated drinks, processed foods, or tea/coffee with sugar. Similarly, children's reported experiences of discomfort, difficulty with biting or chewing, and social aspects such as avoiding smiling or being teased about their teeth remained unchanged.

Discussion

In this study, regarding the caregiver's knowledge of brushing techniques, preintervention median scores and interquartile ranges (Q1, Q3) of the experimental group and the control group showed no high difference between the groups. In support of this study, a randomised controlled trial conducted among 200 children with autism found that at baseline, there was no significant difference between the groups in tooth brushing practice.³⁴ which shows that preintervention both groups had similar scores. Which emphasises the need for intervention.

The study, conducted among 214 children with special needs and caregivers, shows that caregivers' lower oral health knowledge is associated with a high risk of dental issues in their children.³⁵

This study's findings on brushing knowledge after the Comprehensive Oral Health Programme indicate that, following the intervention, the median knowledge

score in the control group remained low, whereas the experimental group showed a significantly higher median score. The difference was statistically significant ($P < 0.001$). Findings from similar studies indicate that a parent-centred training program was effective in increasing toothbrushing frequency and reducing plaque accumulation. At baseline, plaque was visible, but after the intervention, it decreased, indicating improved oral health among children with autism.^[22] A non-randomised comparison study conducted among 56 caregivers and children with hearing impairment revealed that, in terms of knowledge, attitude and practice related to oral education, the mean score at 12 months improved, compared to baseline, which highlights there was significant improvement and positive impact on oral hygiene of the children in the study group.³⁶ However, another study on caregivers' awareness and behaviour on oral health among paediatric and adolescent patients with disabilities reported that limited oral health awareness, lack of regular follow-up, and lack of motivation contributed to minimal oral health practices.³⁷ But the present study showed significant improvement due to structured intervention and caregiver support.

This study also assessed the oral health status of children with special needs; the median scores (Q1, Q3) for oral Health Behaviours and dietary habits were recorded in both groups. In the control group, there were no statistically significant differences between pre- and post-assessment scores. Similarly, the study conducted in India among various children with disabilities showed that severely intellectually disabled children had the highest mean OHI-S, followed by in moderately intellectually disabled children.³⁸ Findings from similar studies indicate that poor oral hygiene practices and unhealthy dietary habits, such as consuming sugary beverages, contribute to inadequate oral care and poor oral health.^{39,40}

The Comprehensive Oral Health Programme on oral health status, consisting of dental behaviours in this study, results indicate that the intervention group showed significant improvement in some areas (dental health, gum health), which highlights caregivers' alertness and behavioural changes that led to improvement. Moreover, statistically significant improvements ($P < 0.05$) were noted in aspects of cleaning habits and dental problems experienced in the past 1 year. The emotional aspects concerning problems with the appearance of teeth, with regard to smiling/laughing and times when made fun of due to dental issues and a decrease in chewing problems showed statistical changes indicating a positive impact of the intervention on oral health awareness and behaviours. Overall, the results show that positive outcomes across several areas promote better oral health. However, some areas did not show significant changes ($P > 0.05$), indicating that caregivers play a key role and more dedication is needed. The other study highlights that oral hygiene interventions, such as oral hygiene training, tooth-brushing training, and pictorial-based learning, were effective in improving oral health, reducing gingival

and plaque index scores, and enhancing tooth-brushing skills. These findings suggest that oral hygiene training is beneficial in improving the dental health of children with special care needs.⁴¹

In this study, the control group results showed only a slight decline in dental health, while all other categories showed no statistically significant changes between pre- and post-assessment scores. This indicates that there was no noticeable improvement in dental visits, perceptions of dental health, or food habits among children in the control group. The systematic review was conducted among children with intellectual and developmental disabilities to assess the incidence of oral health problems and factors associated with oral hygiene. The results emphasised that, despite routine brushing practices reported in studies, oral health status remained unsatisfactory. The study, which was conducted among caregivers of children with autism, highlights a gap between knowledge and oral health practices, suggesting the need for ongoing interventions to address knowledge gaps and negative attitudes that have a significant impact on children's oral health and overall well-being.⁴² There is a need for a holistic approach tailored to the caregiver's individual oral health concerns. The present study showed significant improvement in knowledge and oral health status with caregiver training, supervised demonstrations and follow-ups in the intervention group.

The strength of this study lies mainly in a comprehensive oral health programme that demonstrated the potential to enhance caregivers' knowledge, oral hygiene practices, and overall dental health awareness, through education, counselling, demonstrations and follow-up.

The study's limitations include a limited sample size, which may restrict the generalizability of the findings. The study was also restricted to a specific region of Karnataka, limiting the inclusion of caregivers from different socioeconomic and cultural settings. In addition, the intervention period and follow-up duration were short, which may affect the sustainability of improved dental care practices and the likelihood of better outcomes.

The findings of this study suggest that in the future, organised interactive interventions can be implemented in paediatric rehabilitation and community health services, special schools, and dental health extension programs to promote long-term dental health outcomes. Behavioural changes and improvements in oral health can be further evaluated through multicentre studies conducted over long durations with larger populations incorporating greater digitalisation, such as mobile health applications, digital education methods, and tele-dentistry support. Culturally adapted training manuals with pictographic illustrations should be developed for all caregivers of children with various disabilities.

Conclusion

This study highlights that children with various kinds of disabilities were found to have poor dental care and oral status. The Comprehensive Oral Health Programme

helped to gain sufficient knowledge and provide essential care for children with special needs. There should be oral health education, periodic dental checkups, and promotive programs to support children with special needs and their caregivers. Holistic dental care through interdisciplinary collaboration may help reduce the burden of preventable dental diseases.

Acknowledgements

I thank children with special needs and their parents/caregivers, the experts who validated tools and manuals, and the special educators of various special schools for their help and support.

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Competing Interests

We declare that no significant competing professional, personal or financial interests influence the conduct of this study as described in this study.

Data Availability Statement

The data collected and analysed during this study are not publicly available, as stated in the consent form to all caregivers regarding the confidentiality of information, but are available from the corresponding author upon reasonable request.

Ethical Approval

None to be declared.

Funding

Self-funded.

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