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Original Research Article

BARRIERS AND DIFFICULTIES FACED BY PARENTS IN IMPLEMENTING ORAL HYGIENE MEASURES FOR CHILDREN WITH CEREBRAL PALSY: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Children with cerebral palsy (CP) frequently experience compromised oral health because of motor impairment, difficulty cooperating, and dependence on caregivers for daily oral care. The factors that make oral hygiene maintenance difficult for their parents remain incompletely characterised in Indian settings. The objective is to describe oral hygiene practices, parent-reported difficulty in implementing oral hygiene, and barriers to dental care among children with CP, and to identify child- and family-level factors independently associated with reported difficulty. **Materials and Methods:** A cross-sectional study was conducted among 173 parents of children with CP attending [setting]. A structured, interviewer-administered questionnaire captured sociodemographic characteristics, CP subtype, oral hygiene practices, dental-care access, and difficulty in implementing oral hygiene (yes/no). Associations were tested using the chi-square or Fisher exact test, and independent predictors were identified using multivariable logistic regression. **Results:** Overall, 118 of 173 parents (68.2%) reported difficulty implementing oral hygiene. Difficulty varied significantly by CP subtype, being highest in mixed (84.6%) and ataxic (81.8%) CP and lowest in dyskinetic (50.0%) and spastic (62.5%) CP (p = 0.017). In multivariable analysis, ataxic CP (adjusted OR 3.86, 95% CI 1.34–11.12) and mixed CP (aOR 3.54, 95% CI 1.05–11.92) relative to spastic CP, and older child age (aOR 1.19 per year, 95% CI 1.03–1.37), were independently associated with reported difficulty. Sociodemographic factors — child sex, parental education, per-capita income, family type, and number of children — were not significantly associated. A dental problem was reported in 78.6% of children, and the most frequently cited barriers to accessing dental care were distance to the clinic (46.3%), lack of family help (28.0%), and lack of interest (28.0%). **Conclusion:** Most parents of children with CP report difficulty maintaining their child's oral hygiene, and difficulty is driven more by the child's neuromotor phenotype and age than by socioeconomic status. CP subtype may help identify families needing intensified, individualised oral-care support. Targeted caregiver education and improved access to CP-competent dental services are warranted.

INTRODUCTION

Cerebral palsy (CP) is the most common cause of physical disability in childhood, comprising a heterogeneous group of permanent, non-progressive disorders of movement and posture attributed to disturbances in the developing brain. Cerebral palsy (CP) is a common pediatric disorder occurring in approximately 2–2.5 per 1000 live births.[1] It is a chronic motor disorder resulting from a non-progressive (static) insult to the developing brain.[2] The motor disorders associated with CP are often accompanied by disturbances in coordination, cognition, communication, and seizures.[3,4]

Beyond motor impairment, children with CP frequently experience oromotor dysfunction, impaired self-cleansing mechanisms, difficulty in cooperating during oral care, and near-total dependence on caregivers for daily tooth-brushing. Cerebral palsy patients are at increased risk of developing oral health problems as compared to normal healthy children.[5] Studies have shown that the more severe the neurological insult in children with CP, the higher the risk of dental disease.[6,7] This

is due to multiple factors including motor and coordination difficulties, as well as limited oral care and hygiene.

Difficulties in conducting daily oral hygiene, intraoral sensitivity, and oro-facial motor dysfunction are the main contributing factors to the development of various oral manifestations in these patients.[8] Enamel hypoplasia and a lack or ineffectiveness of tooth-brushing (performed by the child alone) may also be risk factors for maintaining poor oral hygiene.[9]

The degree of cognitive and motor defects is directly proportional to the risk of developing oral diseases in them. Several studies have shown that gingival hyperplasia and associated bleeding occur more in children with CP.[10,11] Swallowing difficulties and recurrent chest infections are associated with the development of dental erosion.

Such children are dependent on their caregivers for maintaining oral and dental hygiene since motor incoordination affects their ability to perform adequate oral hygiene.[12] Parents and caretakers of such children are primarily responsible for their oral hygiene, dietary habits, dental service utilization, and making treatment decisions for them. Studies show that parents' education, stress levels, oral health beliefs, attitudes, and cultural factors are strongly linked to proper dental service utilization for their children.[13,14] Furthermore, they are more likely to aspirate dental filling materials and debris from the preparation of the tooth, making it difficult for the dental surgeons as well.

These features place children with CP at substantially elevated risk of dental caries, gingival inflammation, and periodontal disease. Because the child cannot reliably brush independently or rinse effectively, the burden of maintaining oral hygiene falls on parents and caregivers, who must integrate oral care into an already demanding caregiving routine. The extent to which parents find this achievable — and the factors that make it easier or harder — has direct implications for the design of caregiver-directed preventive interventions.

Much of the existing literature has emphasised the sociodemographic determinants of oral health in children with disabilities, including parental education and household income. However, it is plausible that in children with CP the child's own neuromotor phenotype — the clinical subtype and its functional consequences — is at least as important as family socioeconomic position in determining how difficult day-to-day oral care actually is. Data addressing this question from Indian settings, where access to disability-competent dental services is often limited, remain scarce.

Many studies have demonstrated the influence of parents' dental health habits on their children's oral health.[15] These studies emphasize the importance of the entire family, particularly lifestyle and oral health habits.

By interviewing each parent, this study intends to provide insight into the influence of working mothers and other caregivers on a child's oral health. Face-to-face interviews and questionnaire sessions helped us to obtain more spontaneous and sincere responses from parents.

The present study was therefore undertaken to describe oral hygiene practices, the difficulty parents report in implementing oral hygiene, and the barriers they face in accessing dental care for their children with CP, and to identify the child- and family-level factors independently associated with reported difficulty.

MATERIALS AND METHODS

After obtaining the institutional ethical clearance, a cross-sectional, questionnaire-based study was conducted over one year among parents of children with a confirmed diagnosis of cerebral palsy attending the Paediatric outpatient department of a tertiary healthcare center of Kolkata. Parents or primary caregivers of children of age up to 12 years, clinically diagnosed with CP were included in the study. Informed written consent was obtained from all the participants. Children suffering from any other systemic disorder or psychiatric illness or those parents or caregivers who refused to give consent were excluded from the study. All the eligible parents attending the OPD within the time period of the study were approached and a total of 173 parents were enrolled by convenience sampling as per the inclusion and exclusion criteria.

Data collection instrument

A structured, interviewer-administered validated questionnaire was used for interviewing the parents selected for the study. During the interview, no advice was given to the parents, as genuine information about the parents' oral health knowledge and the difficulties encountered in implementing oral hygiene practices for their children was required. The parents were encouraged to express their daily difficulties in different domains, including those related to implementing their children's oral hygiene. The questionnaire captured: (i) sociodemographic characteristics (residence, respondent's relation to the child, primary caregiver, parental education and occupation, monthly per-capita income, family type, number of children, and presence of any other affected family member); (ii) child characteristics (age, sex, and CP subtype — spastic, dyskinetic, ataxic, or mixed)19; (iii) oral health status and hygiene practices (presence of a dental problem, caries/discoloration, gum bleeding, ability to spit, brushing independence, frequency and duration of brushing, brush and paste type, and rinsing habits); (iv) caregiver involvement and support; and (v) dental-care access and barriers. The primary outcome was the parent's response to the single item, “Do you face difficulties in implementing oral hygiene of your child?” (yes/no).

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Statistical analysis

Categorical variables were summarised as frequencies and percentages, and continuous variables as mean ± standard deviation (or median and range). Associations between the primary outcome and candidate explanatory variables were assessed using the Pearson chi-square test, or the Fisher exact test where expected cell counts were below five. Variables associated with the outcome at the bivariate level, together with a priori clinically relevant variables, were entered into a multivariable binary logistic regression model to identify independent predictors; adjusted odds ratios (aOR) with 95% confidence intervals (CI) are reported. To avoid circularity, variables representing clinical consequences of poor oral hygiene (e.g. presence of a dental problem, caries, gum bleeding) and the subjective item on perceived neglect were examined as correlates but were not entered as predictors in the primary model. Model discrimination was assessed using the area under the receiver-operating-characteristic curve (AUC), with internal validation by 500-sample bootstrap resampling to obtain an optimism-corrected estimate; calibration was assessed using the Hosmer–Lemeshow test, and multicollinearity using variance inflation factors (VIF). Because several predictor categories contained small cell counts, a Firth penalized-likelihood logistic regression was fitted as a sensitivity analysis to guard against small-sample bias and separation. A two-sided p-value < 0.05 was considered statistically significant.

RESULTS

Participant characteristics

A total of 173 parents of children with CP participated. The children's mean age was 6.7 ± 2.7 years (range 1–15); 94 (54.3%) were male and 79 (45.7%) female. Spastic CP was the most common subtype (96, 55.5%), followed by ataxic (33, 19.1%), mixed (26, 15.0%), and dyskinetic (18, 10.4%). Most families were nuclear (123, 71.1%), and 129 children (74.6%) had at least one sibling. The mother was the primary caregiver in 141 households (81.5%). Another family member with a disability was reported by 24 respondents (14.0%). Full participant characteristics are shown in [Table 1].

Table 1: Sociodemoaphic and clinical characteristics of the study population (N = 173)

Characteristic	Category	n (%)
Child age, years	Mean ± SD	6.7 ± 2.7
Child sex	Male	94 (54.3)
	Female	79 (45.7)
CP subtype	Spastic	96 (55.5)
	Ataxic	33 (19.1)
	Mixed	26 (15.0)
	Dyskinetic	18 (10.4)
Residence	Urban	102 (59.0)
	Rural / village	71 (41.0)
Family type	Nuclear	123 (71.1)
	Joint	50 (28.9)
Number of children	Multiple	129 (74.6)
	One	44 (25.4)
Primary caregiver	Mother	141 (81.5)
	Father	19 (11.0)
	Others	13 (7.5)
Monthly per-capita income	≥ Rs 7770	138 (79.8)
	Rs 3808–7769	32 (18.5)
	Rs 2253–3808	3 (1.7)
Another affected family member	Yes	24 (14.0)
Mother education	High school	51 (29.5)
	Pre-university	44 (25.4)
	College	31 (17.9)
	Primary	30 (17.3)
	Post-graduate	17 (9.8)

Oral hygiene practices and oral health status

A dental problem was reported in 136 children (78.6%); caries or tooth discoloration was noted in 130 (75.1%) and gum bleeding in 88 (50.9%). While 144 children (83.2%) were reported to brush "on their own," only 107 (61.8%) were able to spit out and 107 (61.8%) rinsed after meals, underscoring incomplete self-cleansing. Twice-daily brushing was reported for 119 children (68.8%); a manual toothbrush (67.1%) with soft bristles (84.9%) and toothpaste (88.4%) was most common, though 45 children (26.0%) were cleaned using a finger. A horizontal brushing motion predominated (53.2%). Detailed practices are presented in [Table 2].

Table 2: Oral hygiene practices and oral health status of the children (N = 173)

Variable	Category	n (%)
Dental problem present	Yes	136 (78.6)
Caries / discoloration	Yes	130 (75.1)

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Gum bleeding	Yes	88 (50.9)
Child able to spit out	Yes	107 (61.8)
Brushes independently	Yes	144 (83.2)
Brushing frequency	Twice daily	119 (68.8)
	Once daily	38 (22.0)
	≥ Thrice daily	16 (9.3)
Toothbrush type	Manual	116 (67.1)
	Finger	45 (26.0)
	Powered	6 (3.5)
Bristle type	Soft	141 (84.9)
Dentifrice	Toothpaste	153 (88.4)
Rinses after every meal	Yes	107 (61.8)
Age started brushing, years	Mean ± SD	2.7 ± 1.3
Brushing duration, minutes	Mean ± SD	4.1 ± 1.6

Difficulty implementing oral hygiene and its determinants

Overall, 118 of 173 parents (68.2%) reported difficulty in implementing oral hygiene for their child. On bivariate analysis, difficulty was significantly associated with CP subtype (p = 0.017), older child age (p = 0.042), and the presence of another affected family member (p = 0.049). In contrast, child sex, parental education, per-capita income, family type, number of children, residence, and the child's brushing independence showed no significant association (all p > 0.3). Bivariate results are summarised in [Table 3], and the distribution of difficulty across CP subtypes is shown in [Figure 1].

Table 3: Factors associated with parent-reported difficulty implementing oral hygiene (bivariate analysis)

Factor	Difficulty, n/N (%)	p-value
CP: Spastic	60/96 (62.5)	0.017
CP: Dyskinetic	9/18 (50.0)	
CP: Ataxic	27/33 (81.8)	
CP: Mixed	22/26 (84.6)	
Another affected member: Yes	21/24 (87.5)	0.049
Another affected member: No	96/148 (64.9)	
Child sex: Female	—	0.596
Parental education (college+)	—	0.521
Income below top band	—	0.799
Family type: Nuclear	—	0.348
Multiple children	—	0.571
Urban residence	—	0.492
Child brushes independently	—	0.493

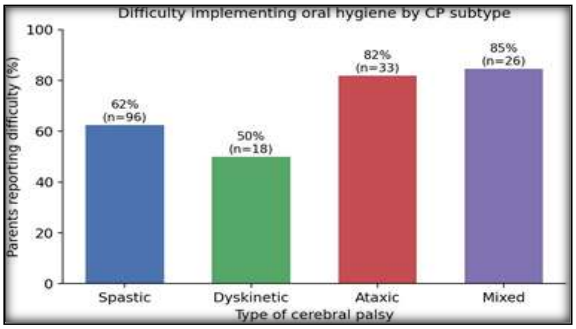

Figure 1: Proportion of parents reporting difficulty implementing oral hygiene, by cerebral palsy subtype. Difficulty was highest in mixed and ataxic CP

In the multivariable logistic regression model (Table 4), ataxic CP (aOR 3.86, 95% CI 1.34–11.12; p = 0.012) and mixed CP (aOR 3.54, 95% CI 1.05–11.92; p = 0.042), relative to spastic CP, remained independently associated with reported difficulty, as did older child age (aOR 1.19 per year, 95% CI 1.03 1.37; p = 0.022). Dyskinetic CP did not differ significantly from spastic CP. Sociodemographic covariates and the presence of another affected family member were not independent predictors after adjustment.

Table 4: Multivariable logistic regression for parent-reported difficulty implementing oral hygiene (N = 172). Firth-penalized estimates are reported in the text as a sensitivity analysis

Predictor	Adjusted OR (95% CI)	p-value
CP: Ataxic (vs spastic)	3.86 (1.34–11.12)	0.012
CP: Mixed (vs spastic)	3.54 (1.05–11.92)	0.042
CP: Dyskinetic (vs spastic)	0.78 (0.25–2.41)	0.663
Child age (per year)	1.19 (1.03–1.37)	0.022
Another affected member	2.63 (0.70–9.95)	0.155
Nuclear family	1.87 (0.85–4.10)	0.119
Child female	1.30 (0.64–2.62)	0.472
Multiple children	1.07 (0.47–2.42)	0.875
Income below top band	1.18 (0.47–2.94)	0.728
Urban residence	0.63 (0.29–1.39)	0.252

Model fit: McFadden pseudo-R^2 = 0.11. Reference category for CP subtype is spastic.

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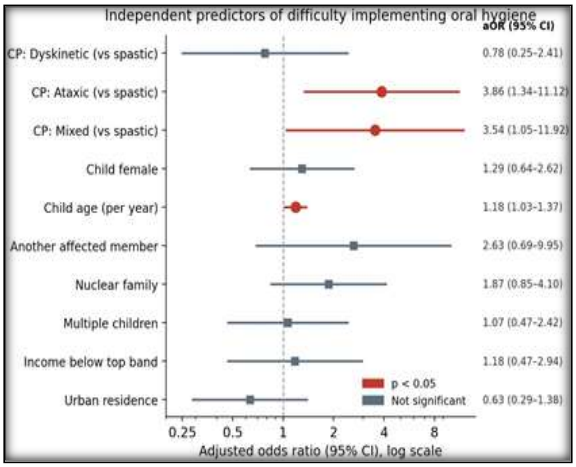

Figure 2: Forest plot of adjusted odds ratios (95% CI) for parent-reported difficulty implementing oral hygiene. Estimates in red are statistically significant (p < 0.05). Ataxic and mixed cerebral palsy and older child age were the only independent predictors.

The model showed acceptable discrimination (apparent AUC 0.73; optimism-corrected AUC 0.66 after 500-sample bootstrap internal validation) and good calibration (Hosmer–Lemeshow p = 0.80). All variance inflation factors were below 1.3, indicating no meaningful multicollinearity. In the Firth penalized sensitivity analysis, the direction and magnitude of effects were preserved: ataxic CP (aOR 3.42, 95% CI 1.23–9.51; p = 0.018) and older child age (aOR 1.17 per year, 95% CI 1.02–1.35; p = 0.030) remained significant, while mixed CP was attenuated to borderline significance (aOR 3.10, 95% CI 0.97–9.89; p = 0.057), consistent with the smaller number of children in that subgroup.

To illustrate the joint clinical effect of the two principal predictors, [Figure 3] shows the model-predicted probability of difficulty across child age for each CP subtype. Predicted difficulty rose with age in every subtype and was consistently highest for ataxic and mixed CP, exceeding 80% in older children with these phenotypes.

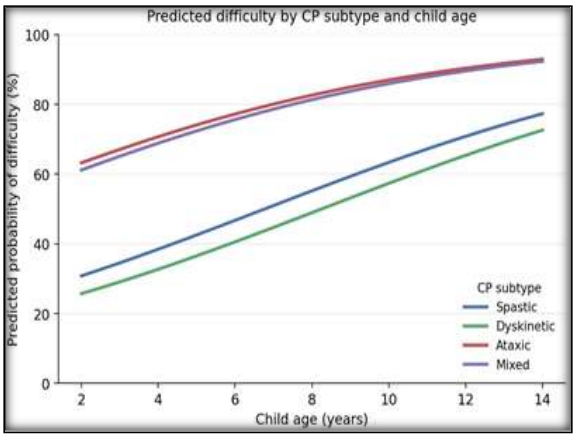

Figure 3: Model-predicted probability of parent-reported difficulty implementing oral hygiene, as a function of child age and cerebral palsy subtype. Curves are derived from the multivariable logistic model with other covariates held at their reference categories

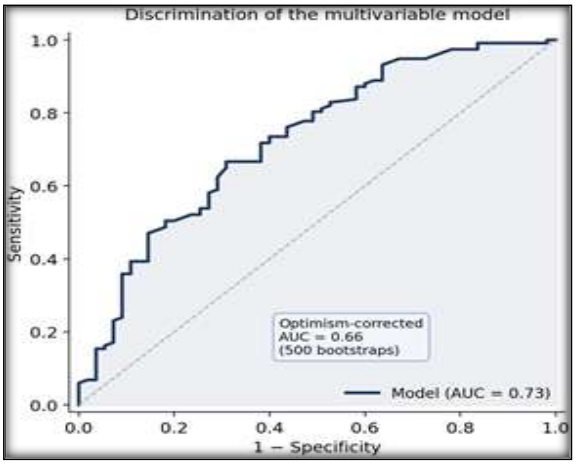

Figure S1: (supplementary). Receiver-operating-characteristic curve for the multivariable model. Apparent AUC 0.73; optimism-corrected AUC 0.66 (500-sample bootstrap).

Barriers to dental care

Annual dental visits were reported by 90 parents (52.0%); most attended a government dental college (61.3%). Although 82.6% felt the dentist was trained to manage a special-needs child and 75.5% rated their last visit as good, access barriers were common. The most frequently cited barriers were distance of the clinic from home (46.3%), lack of family help (28.0%), lack of interest (28.0%), financial constraints (22.0%), and lack of knowledge (20.1%). [Figure 2]

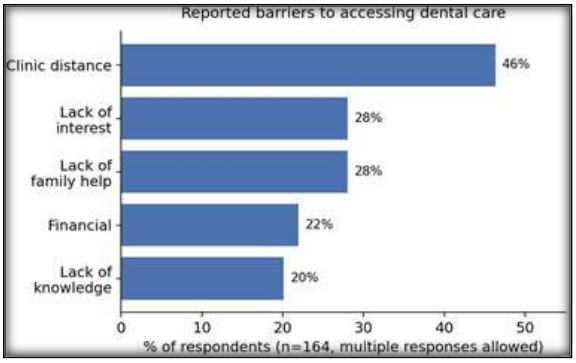

Figure 4: Parent-reported barriers to accessing dental care (n = 164; multiple responses permitted).

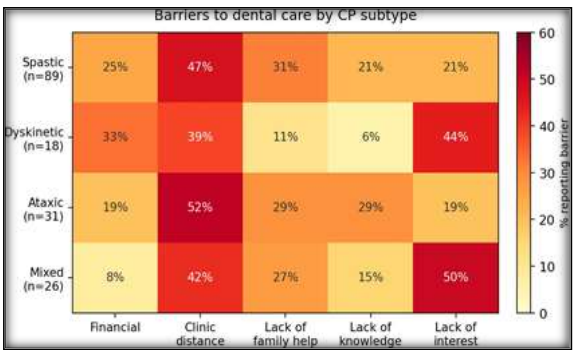

Figure 5: Barriers to dental care stratified by cerebral palsy subtype (row percentages; multiple responses permitted). Distance to clinic and lack of family help were prominent across subtypes.

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DISCUSSION

In this cross-sectional study of 173 parents of children with cerebral palsy, roughly two-thirds reported difficulty implementing their child's oral hygiene. The central finding is that this difficulty was driven predominantly by the child's neuromotor phenotype and age rather than by family socioeconomic position: after multivariable adjustment, ataxic and mixed CP subtypes and older child age were the only independent predictors of reported difficulty, whereas parental education, household income, family type, and number of children showed no significant association.

In our study the majority of the children were males which are consistent with findings of the study done by Sedky NA and many other researchers.[16-19] This pattern is clinically intuitive. Ataxic and mixed CP are characterised by impaired coordination and, in mixed forms, a combination of spasticity with involuntary or poorly coordinated movements, which can make controlled intra-oral access during brushing especially challenging. The finding that dyskinetic CP did not differ significantly from spastic CP, despite involuntary movements, may reflect the smaller number of children in this subgroup and warrants confirmation in larger samples. The independent effect of older child age is also plausible: as children grow, increasing size, stronger resistance behaviours, and greater autonomy-seeking may complicate caregiver-delivered oral care, even as fine-motor self-care remains limited. In a study conducted by Loyola-Rodríguez JP and others, dental caries was more common in mixed type of CP as was evident by the significantly higher DMFT index in this subtype of CP.[20]

That socioeconomic variables were not significant predictors is noteworthy and contrasts with some prior work emphasising income and parental education as determinants of oral health in children with disabilities. One interpretation is that, for children with CP, the physical demands of oral care imposed by the disability itself may override the resource-related advantages that higher socioeconomic status can confer. It is also possible that the relatively narrow income distribution in this sample — with nearly four-fifths of families in the top income band — limited the ability to detect a socioeconomic gradient. However, several other studies have reported that the Oral Health-Related Quality of Life of children with CP has strong negative association with low family income.[21,22]

The high prevalence of reported dental problems (78.6%), caries or discoloration (75.1%), and gum bleeding (50.9%) is consistent with the well-documented oral health vulnerability of children with CP.[23,24] Notably, although most children were reported to brush “on their own,” fewer than two-thirds could spit out or rinse effectively, and a quarter were cleaned using a finger — highlighting a gap between nominal brushing and effective plaque removal. These observations reinforce that self-reported brushing independence is a poor proxy for adequate oral hygiene in this population and that caregiver supervision remains essential.

Barriers to dental care were dominated by structural and logistical factors — distance to the clinic, lack of family help, and lack of interest — rather than by perceived provider incompetence, since most parents felt the dentist was adequately trained and rated their visit positively. This suggests that improving access may depend as much on reducing travel and support burdens (for example, through community-based or outreach dental services and caregiver-support networks) as on clinician training alone.

Taken together, these findings suggest a practical clinical message: CP subtype and child age can help identify families most likely to struggle with daily oral care, allowing preventive resources — intensified caregiver instruction, adjunctive measures, and closer recall — to be targeted where they are most needed.

Strengths and limitations

Strengths of this study include a reasonable sample size for a hard-to-reach population, near-complete data, and a multivariable analytic approach that separates the child's phenotype from socioeconomic factors, with internal validation and a Firth penalized sensitivity analysis confirming the robustness of the principal findings. Several limitations should be acknowledged. First, the cross-sectional design precludes causal inference. Second, participants were recruited from a single centre by convenience sampling, and the predominance of higher-income, urban families limits generalisability and may have attenuated socioeconomic associations. Third, the primary outcome and exposures were parent-reported and subject to recall and social-desirability bias; oral health status was not independently verified by clinical examination. Fourth, the questionnaire's psychometric properties were [not formally validated / validated as described], and difficulty was captured as a single binary item rather than a graded scale. Finally, the presence of clinically consequent variables (dental problems, gingival bleeding) as correlates of difficulty should not be interpreted causally, as these may be both consequences and markers of hygiene difficulty.

CONCLUSION

Most parents of children with cerebral palsy report difficulty maintaining their child's oral hygiene. This difficulty is associated primarily with the child's CP subtype — being greatest in ataxic and mixed forms — and with older child age, rather than with family socioeconomic status. CP subtype and age may therefore serve as simple markers to identify families needing intensified, individualised oral-care support. Alongside caregiver education, addressing structural barriers to dental access — particularly clinic distance and lack of support — is likely to be

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important for improving oral health outcomes in this vulnerable group. Larger, multi-centre, and preferably longitudinal studies incorporating clinical oral examination are needed to confirm these findings and to evaluate targeted interventions.

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