Access Barriers to Dental Care Among Visually Impaired Children: Perspectives and Challenges in Kerala

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ABSTRACT:

Visually impaired children are a small yet disproportionately large population within the oral health system that is not well served. Children with visual impairment still have worse oral health, including oral hygiene, caries experience and significant treatment needs, compared to children with sight. Children with visual impairment have significant oral health treatment needs, more caries experience, and poor oral hygiene compared to children with sight despite the many advantages that Kerala has in terms of literacy, primary health infrastructure, and human development indicators. This is a narrative review which collates the existing literature on the visual impairment children's access to dental care from the Indian and international context with a specific focus on the context of Kerala. Drawing on the classic five-dimensional approach of Penchansky and Thomas (1981) to providers, caregiver, child, and system-level barriers, evidence is organised accordingly. The prevalence of dental caries in visually impaired (VI) children in the permanent dentition is reported among the children aged between 40–52% and the main barriers identified by the providers are lack of training and low

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motivation of the caregivers (Adyanthaya et al., 2017). Results from research on facilitators show that multisensory oral health education (MOHe) (Braille text, audio aids and audio-tactile performance techniques) has been shown to have measurable short-term effects on oral health knowledge and plaque control. The review concludes there is a need for a coordinated effort to improve access through dental education, school-based screening, financing, and physical and communicative design of dental services. Recommendations are provided for health planners, special schools and clinicians in Kerala.

Keywords: visual impairment; children; dental care; access barriers; oral health; special needs; Kerala

1. Introduction

The health of the mouth, teeth and gums is related to overall health, nutrition, communication, self-esteem and quality of life – and the roots of good oral health are in childhood. The normal maintenance of oral health becomes much more complicated for children living with disability, however. In particular, visual impairment can impact how a child learns and practices the manual skills that are key to plaque control. In traditional health education, visual feedback plays a crucial role in toothbrushing, interdental cleaning, and self-monitoring of oral cleanliness, and visually impaired children have a structural disadvantage from an early age due to the lack of visual feedback (Shetty et al., 2010). The World Health Organization (2019) estimated that, globally, 2.2 billion people have a vision impairment, many of whom could be prevented or could yet be addressed. This burden is high in India and although the prevalence of childhood visual impairment is lower than that of impairment in older age, the lifetime cost is high due to the impact it has on development, education and social participation across many decades of childhood (Pascolini & Mariotti, 2012). In this population, however, oral health care is often not a priority, not because the biology of dental disease is different, but because the routes of access to prevention and treatment are clogged at various stages. Kerala, in its entirety, offers a telling paradox. The state enjoys the highest literacy rate and some of the most favourable human development and primary healthcare indicators among all other states in India and also has a large number of dental colleges and private practitioners. Given this situation, it would be expected that Kerala's visually challenged children have reasonably good access to dental care. However, the data from the state itself indicates that there are still many obstacles that stem not only from the lack of services, but also from the way that services are trained, organized, financed and communicated (Adyanthaya et al., 2017). It is important to know the reasons behind not achieving access despite the apparent good supply of resources, not only for Kerala, but for other similar areas. This paper has three aims. First, it reviews the current knowledge about the oral health status of visually impaired children, mainly based on Indian cross sectional studies. Second, it presents the barriers to dental care in a conceptually organised manner, in line with a conceptual framework of access to health care.Second, it arranges the barriers to dental care in a structured way, based on a conceptual framework of access to health care, enabling the findings to be read as a system and not as a list. Thirdly, it brings together the views of the key stakeholders (dental practitioners, caregivers, special educators and the children themselves) and provides policy directions and practical facilitators relevant to Kerala. The narrative review and conceptual analysis is a paper and the quantitative data presented in the tables, charts

are from cited literature and do not represent data collected during this study.

2. Visual Impairment Among Children: Global and Kerala Context

Visual impairment in children is a continuum from low vision to blindness, and can be caused by congenital and hereditary disease, perinatal injury, vitamin A deficiency, infection, or uncorrected refractive errors. The functional consequence relevant to oral health is the same for all causes: the child is unable to use sight to learn, imitate and check the manual hygiene technique. A visual impaired child needs to build the same competence through verbal instructions, touch and proprioception (Mahantesha et al., 2015), while a sighted child observes the act of the parent and then mimics in a mirror. Most of the childhood blindness in India is treated in special schools many of which are residential, located by government, aided and voluntary bodies. These institutions localize visually handicapped children in easily identifiable environments and in principle provide a very effective point of contact for health programs in the school. The availability and effectiveness of oral health services to these schools in practice is very inconsistent and of low quality. The state of Kerala has many strong points in the field of education and outreach in the country, but the special schools for the blind are dependent on the enthusiasm of the nearby dental institutions and practitioners for providing regular and structured guidance instead of occasional charitable camps. Two things in the context of Kerala need to be emphasised. This is the first, and most important, the high level of literacy of the caregiver, which is a real asset: A literate parent or house-parent can grasp and reinforce oral hygiene instructions more easily as long as the instruction can be presented in a manner they can understand. The second relates to the relative density of human resources in the dental profession, that is, the relative lack of a dentist who can be reached. Rather, the barriers are whether there are accessible dentists who can treat visually impaired children, whether services are available and accessible, and whether families can afford and access services. They are important distinctions because they indicate different solutions, and most appropriately explored in a framework of 'access'.

3. Oral Health Status of Visually Impaired Children

The findings in both Indian and international studies have been consistent that there has been a greater burden of oral disease and a poorer oral hygiene in the visually impaired children as compared to the children of the general population, but with differences depending on the setting, age and the indices used. In south Indian population Shetty et al (2010) found sub-optimal oral health with prevalence of dental caries being high and prevalence of moderate to severe gingivitis being moderate. In a study of children with visual impairment in Bangalore, Prashanth et al. (2011) found that there was a strong association between caries experience and oral hygiene status, suggesting that relatively small extra assistance from parents/caretakers could result in significant decreases in oral disease burden. Research which directly compares visually impaired children with sighted children helps to further clarify the picture. Similarly, in the institutionalised children of the eastern part of Odisha, Suresan et al. (2017) observed a prevalence of caries of about 15% in primary dentition and 46% in permanent dentition, with a high prevalence of traumatic dental injury again, which is more likely to happen if the vision is impaired, and falls occur more frequently. In a similar study, John et al. (2017) reported low level of oral hygiene knowledge and practices as well as high level of caries experience among the visually challenged in Chennai. In all of these studies, the prevalence of caries for children with visual impairments falls within a wide range (40–52% as shown in Figure 2). There are examples of mechanisms that have been well practised. It's more difficult to monitor and measure plaque control when we are blind, dietary habits in residential environments are likely to be conducive to eating cariogenic foods, access to professional cleaning and fluoride and restorative care is irregular, and traumatic injuries to the anterior teeth may not be detected or treated. It is important to note that there is no literature that

indicates that dental disease is caused in any biological sense by visual impairment. Instead, it takes away one of the main ways in which preventive behaviour is usually taught and reinforced, and it's located downstream of an inadequately designed service system. Representative status studies, summarized in Table 1, have been performed in many cases.

Study (author, year)	Setting	Key oral-health finding	Implication
Shetty et al. (2010)	South India	High caries; moderate–severe gingivitis	Plaque control deficient without sight
Prashanth et al. (2011)	Bangalore	Caries linked to oral hygiene status	Caregiver support can reduce disease
John et al. (2017)	Chennai	Poor knowledge/practice; high caries	Education gap is central
Suresan et al. (2017)	Eastern Odisha	Permanent-dentition caries ~46%; raised trauma	Trauma + caries both unmet
Adyanthaya et al. (2017)	Kerala (dentist survey)	Training and motivation cited as top barriers	Supply-side reform needed

Table 1. Representative studies on oral health status and barriers among visually impaired children.

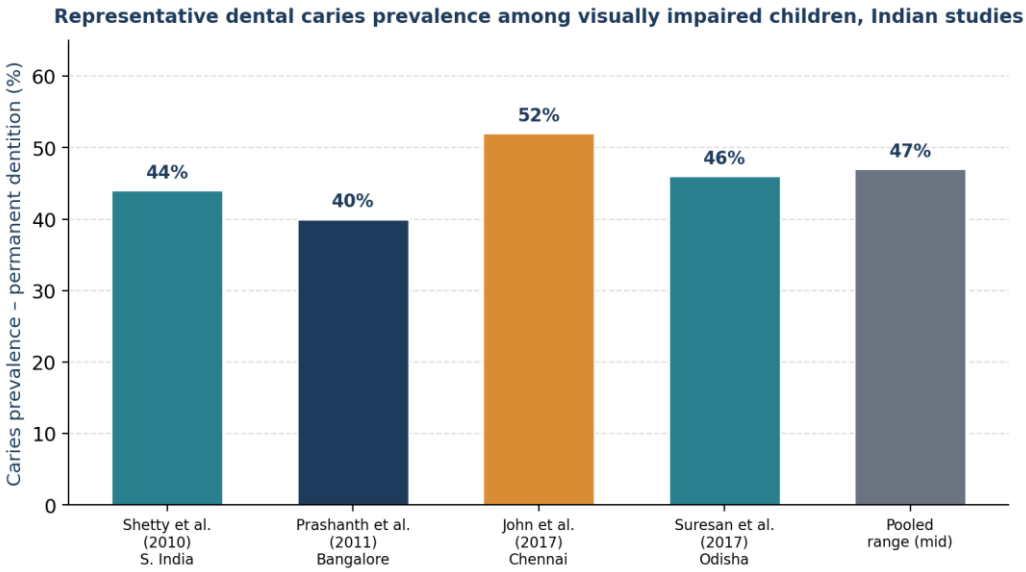

Figure 2. Representative dental caries prevalence (permanent dentition) reported among visually impaired children in selected Indian studies. Values are indicative of the literature range; exact figures vary by index and setting.

4. A Conceptual Framework for Access Barriers

This review takes a different approach from a list of problems, instead using the influential access framework of Penchansky and Thomas (1981) which views access as a 'fit' between patients and the health system across five dimensions. Availability is a measure of the availability of suitable services and trained providers. Accessibility refers to both geographical and physical availability of services, such as transport and built environment. Affordability relates to the affordability of care in relation to the family's capacity to pay. Accommodation relates to the way in which services are structured (appointment systems, waiting times, communication, design of clinical encounter). Acceptability relates to the attitudes, expectations and trust that patients and providers have of each other. This is an appropriate approach for children with visual impairment since their disabilities are seldom found in one aspect of their lives. A child may live near a dentist (accessibility good), but no dentist nearby feel qualified to treat her (availability and acceptability is poor), or be seen but not receive hygiene instructions in a way that they can use (accommodation is poor). The five dimensions are brought together in the context of child access to care; each dimension is explored in the context of Kerala in the sections that follow; and Table 2 identifies concrete manifestations and possible responses.

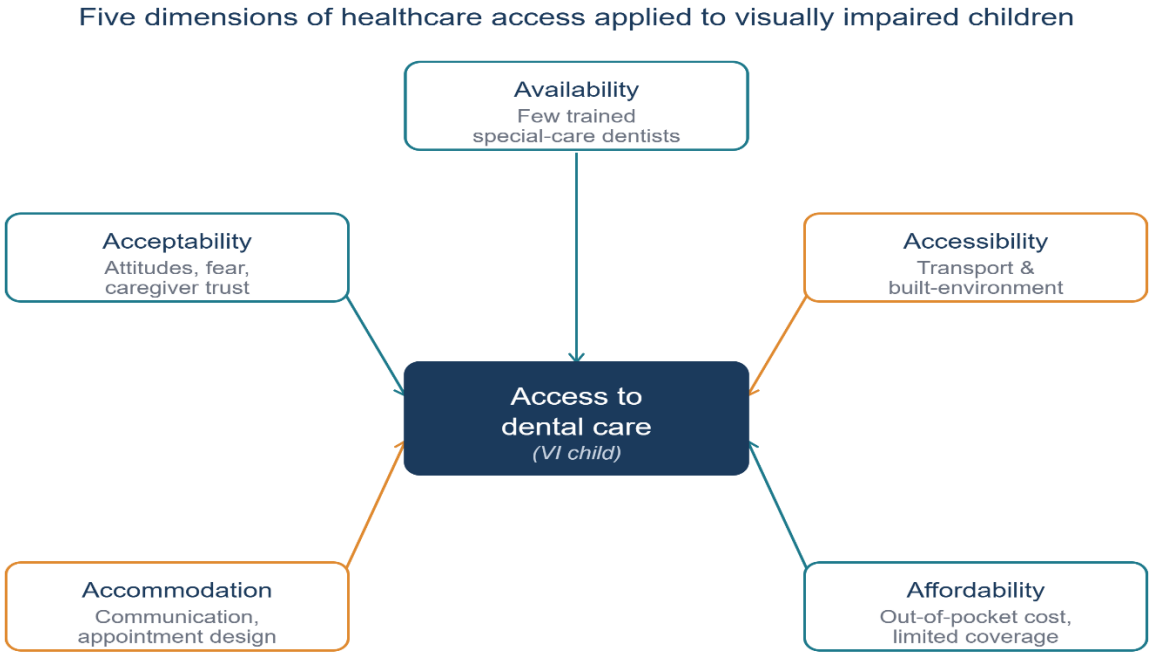

Figure 1. The five dimensions of healthcare access (Penchansky & Thomas, 1981) applied to visually impaired children.

5. Dimensions of Access Barriers in Kerala

5.1 Availability: trained providers and special-care services

There are no dearth of dentists in Kerala. Whereas, it is lacking in practitioners who have received training and confidence in the area of special-care dentistry, as in most of India. The most recent, and perhaps most relevant, evidence is from Adyanthaya et al. (2017), who conducted a survey of 149 dental professionals in Kerala regarding challenges to the treatment of children with special needs. Practitioners' level of training and the lack of motivation among the caretakers were the most common barriers reported. Perhaps most importantly, the authors revealed that more competent dentists said that they saw these children more frequently, suggesting that exposure and competence feed off each other — and that inexperience becomes self-reinforcing when young dentists avoid a group they feel that they aren't competent enough to treat. The

authors suggested changes in the undergraduate dental curriculum to prepare future dentists, which is consistent with the general dental special-care literature.

5.2 Accessibility: transport and the physical environment

Going to a dental office isn't as easy as it sounds for a visually impaired child. The path is usually accompanied by an adult, has a lot of new signage that is very visual, and involves navigating in built environments that are not often built for non-visual wayfinding. Residential special schools are a partial solution to this as it focuses on bringing the children to the schools. Mobile equipment, steps and rearranged furniture are hazards within the clinic that create orientation issues. Accessibility barriers can be underestimated as they are not visible to planners who do not need to have sight.

5.3 Affordability: cost and financial protection

Kerala has a relatively good public health system, but significant portion of dental services is provided in private sector and out of pocket. Preventive and restorative dental treatments are often not covered by insurance or public schemes and the indirect costs such as the escorting adult's lost income, repeated travelling to and from dental appointments and the longer chair time when an adult's income is at stake and the extra chair time needed because the child is visually impaired adds up to the direct costs. A theme that is clearly evident in the international literature is the financial barrier to dental care for persons with disabilities, especially for preventive care when it is not covered. Education and rehabilitation are already expensive for the families of children with a vision impairment, and dental care may not be one of their top priorities until a problem arises.

5.4 Accommodation: communication and clinical design

It would seem that the most unique disadvantage for the visually impaired children is the degree of accommodation and the most cost-effective change possible is within the dimension of accommodation. The typical dental visit involves a lot of visual demonstration (the dentist demonstrates with a model or chart, or asks the child to look in the mirror). All this doesn't pass on to the sightless child. Communication should be verbal, tactile and patient, with additional time in the clinical workflow. Meeting schedules based on fast-processing times reward the thoroughness that such children require. The silver lining to this is that accommodation can be changed: children who are visually impaired can clearly show improvements in oral hygiene when learning it in a tactile manner, through audio, and in Braille (Chowdary et al., 2016; Gautam et al., 2018).

5.5 Acceptability: attitudes, fear, and trust

The concept of acceptability is bi-directional. At the provider level, there are concerns and/or low levels of confidence in the ability to provide care to children with vision loss, which may manifest as lack of interest, hurried care and/or referral to another provider (as reported by Adyanthaya et al., 2017). From the family side, dental anxiety may be exacerbated because the child has no visual access to the situation and only has to rely on sound, smell and touch to make sense of the situation. Building trust is therefore different: it is established by constantly telling a story verbally, supporting the preparation through gentle touch and continuity of the same provider over time. In the absence of this trust, families might delay seeking care or children may refuse it.

Dimension	Manifestation for visually impaired children	Possible response in Kerala
Availability	Few dentists trained in special-care dentistry; inexperience self-perpetuates	Strengthen undergraduate and CDE training; designate special-care referral clinics
Accessibility	Difficult transport; visually-oriented clinic layouts and signage	School-based outreach screening; tactile/audio wayfinding; safe clinic layout
Affordability	Out-of-pocket costs, indirect costs, longer chair time, weak coverage	Include preventive dental care in schemes; subsidise special-school programmes
Accommodation	Visual demonstration unusable; rushed appointments	Braille/audio/tactile instruction; longer appointment slots; trained auxiliaries
Acceptability	Provider apprehension; child anxiety; fragile trust	Continuity of provider; tell-show(touch)-do; caregiver involvement

Table 2. Access dimensions mapped to barriers and context-specific responses for Kerala.

6. Stakeholder Perspectives

Barriers are felt differently by those who are part of the barrier system and durable solutions should take into account these different views without prioritizing any one. But, as reflected in the Kerala study conducted by Adyanthaya et al. (2017), the dentist's attitude is towards preparedness, wherein many feel underprepared, feel undercompensated for the extra time needed, and feel uncertain about behaviour management. Figure 3 shows an illustrative summary of the relative importance of the provider perceived barriers, usually the least trained clinicians and least motivated caregivers are at the top.

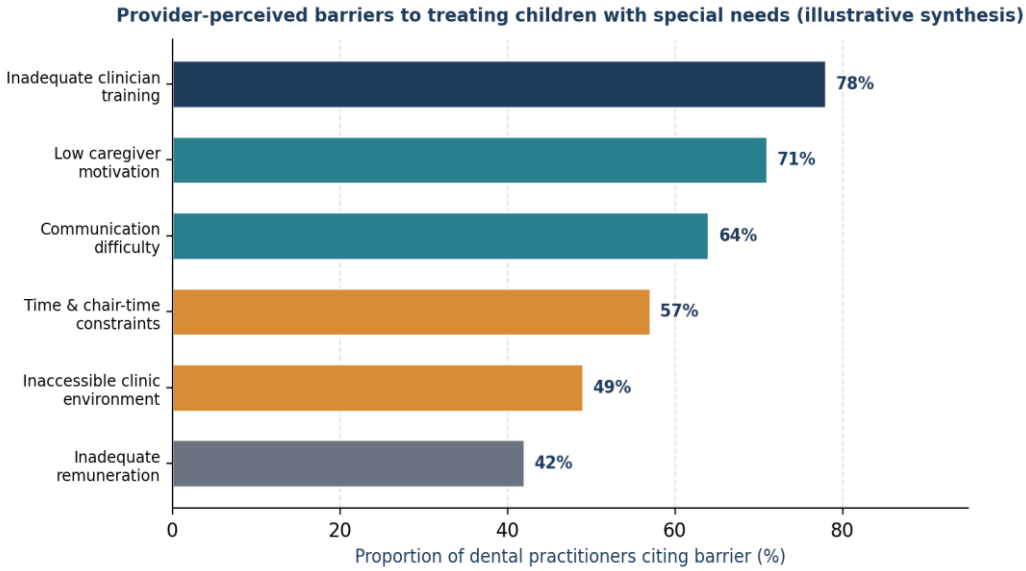

Figure 3. Illustrative synthesis of provider-perceived barriers to treating children with special needs, consistent with patterns reported by Adyanthaya et al. (2017).

Competing demands and asynchrony of information influence the caregiver's perspective. Education, mobility training, and the care of the child's general health are all competing for parents'/house-parents' attention and time in special schools, and oral care may not be deemed a priority, with parents/house parents underestimating their pivotal role in supervising the child's general hygiene and oral health. However, there is evidence that caregivers may also be the most important lever: if they are motivated and equipped, so are children's oral health outcomes, significantly (Prashanth et al., 2011). The special educator's perspective also offers the insight that oral hygiene could be incorporated into the school routine, and that a multisensory approach could be used to teach oral hygiene, similar to the methods used to teach other life skills, making the school an ideal place for both teaching and screening. Last, but not least, the child's voice is often not heard. Children who are visually impaired can express their fear of the unknown, discomfort of being handled without explanation, and frustration when someone assumes sight that they don't have. Focusing on the child involves providing verbal instructions, providing hands-on practice with instruments, and demonstrating skills that the child can learn and self-practise and self-test. These viewpoints clearly converge on the school and the caregiver as agents of change, with an improved-trained and better-organised dental service.

7. Facilitators and Intervention Strategies

What works is documented in the same literature as what is not working. The clear theme is that the oral health education of the visually impaired child should be multisensory, in place of sight, using touch and hearing. Chowdary et al (2016) studied and compared verbal, braille text, and tactile modes of instruction and concluded that controlled supervised programmes proved effective in decreasing dental plaque and gingivitis. Gautam et al. (2018) found that 3 months of audio+braille+tactile models were highly effective in improving oral health status. This is supported by evidence from systematic reviews and meta-analyses, which found that Braille and audiotactile performance (ATP) techniques were effective at improving oral hygiene and knowledge; however, the long-term effectiveness of these techniques beyond the short-term is unknown (Bhor et al., 2021; Deshpande et al., 2023). Interventional work undertaken in Kerala recently is encouraging. In a government aided blind school setting, KP et al. (2024) compared the ATP techniques and braille techniques of oral health education, noting that there was improvement in the oral hygiene index score for both techniques. These studies have established that the accommodation barrier is manageable: a small investment in Braille materials, recorded audio and low cost tactile models can provide effective replicable instruction in special schools. From a broader perspective, the greatest benefits in this population may be derived from prevention and education provided within the school setting, compared to the clinic setting. Three structural facilitators have been identified in the literature besides education. The first is a screening program in school that is directly connected to a thorough follow-up system that ensures that identified disease is treated. The second is training of dental auxiliaries and orientation of dental teams on the unhurried, narrated, tell-show(touch)-do approach to care. The third is the inclusion of the caregivers as partners who strengthen the habits every day – if the improvements are made in the clinic, they fizzle out without help at home. Table 3 summarises the recommendations from the various stakeholder groups.

Stakeholder	Priority actions
Dental schools & councils	Embed special-care dentistry in undergraduate training and continuing dental education; provide supervised clinical exposure to children with disabilities.
Practitioners & clinics	Adopt longer appointment slots, tell-show(touch)-do communication, continuity of provider, and a safe, orientation-friendly clinic layout.
Special schools	Deliver routine multisensory oral hygiene education (Braille, audio, tactile models); host periodic screening with referral linkage.
Caregivers	Supervise and reinforce daily brushing; accompany children to appointments; communicate concerns to providers.
Health planners	Extend financial protection to preventive dental care; fund school-based programmes; designate accessible special-care referral centres.

Table 3. Recommendations to improve dental care access for visually impaired children in Kerala.

8. Limitations

This review should be interpreted with a number of caveats. First, it is a narrative and not a systematic synthesis and second, the studies reviewed vary in design, age range, indices, and setting, all of which preclude direct comparability; therefore, the prevalence values presented in Figure 2 are based on the range of prevalence values presented in the literature and not a pooled estimate. Second, the primary data on oral health of children with visual impairment in Kerala are limited, and the data presented here is largely drawn from data available from other Indian states as well as available literature on special needs in general. Third, intervention studies that have shown Braille and audio-tactile education to be effective are generally short-term, and the likelihood of enduring behaviour change is unknown. Lastly, the provider-barrier figure is illustrative synthesis provided to facilitate discussion along the directionality of the findings of Kerala survey and is not to be interpreted as a strictly proportional measurement. These clean spaces are themselves a demand for research which is well planned and focused in Kerala.

9. Conclusion

However, it is incorrect to say that the barriers faced by visually impaired children in Kerala can be attributed to just one cause and it is in fact a compound one. The state's high literacy level, health system and dental workforce contribute to its strengths, with binding limitations not being the lack of services but the service delivery system in terms of training, organisation, funding and communication. Read all five dimensions of access—under prepared providers, financially vulnerable families, poor clinical environments and appointment systems, and weak trust on both sides of the chair. Concurrently, there is a clear and affordable path forward that can be found in the literature: multisensory oral health education in special schools, screening linked to functional referral, some curriculum change to the benefit of confident special-care practitioners, small financial protection for screening, and the consistent engagement of caregivers. Kerala is a unique place to implement these recommendations, and through such action, could provide a replicable model for enhancing oral health equity for children with disabilities in India.

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