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ORIGINAL RESEARCH

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Caries status, caries risk assessment and acceptance of behavior management techniques used in dental care for children with special healthcare needs in Saudi Arabia

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Abstract

Background: Children with special healthcare needs are at heightened risk for oral health issues, such as dental caries, due to medical, behavioral and socioeconomic challenges. This study assessed the oral health status, caries risk and parental acceptance of behavior management techniques (BMTs) for children with special healthcare needs in Saudi Arabia. **Methods**: A cross-sectional study was conducted on 137 children with hearing, visual, or intellectual disabilities, using the Caries Management by Risk Assessment (CAMBRA) protocol for caries risk assessment. The Decayed, Missing, and Filled Teeth (DMFT) and deft(decayed, extracted, and filled teeth) index and behavior questionnaires were used to assess caries status and parental preferences for BMTs. Descriptive statistics, Analysis of variance (ANOVA) and Chi-square tests were used for data analyses. **Results**: The study found a high prevalence of caries among children with special healthcare needs, with the mean DMFT score significantly associated with parental education and the type of disability. Children whose parents had lower education levels had a higher caries risk. The majority of participants (71.5%) were found to be in the high risk category of caries risk assessment. The most common disease indicators being visible cavities (96.3%) and the most frequently reported caries risk factor was frequent snacking (64.2%). The most accepted BMTs by parents were Distraction (81.0%) and Positive Reinforcement (77.4%), while physical restraint methods were the least accepted. **Conclusions**: The findings highlight the need for targeted, individualized dental care and behavior management strategies for children with special healthcare needs. Educational interventions for parents could reduce caries risk and improve dental health outcomes in this vulnerable population.

Keywords

Caries; Disability; Caris risk assessment; CAMBRA; Behavior management techniques

1. Introduction

Children with special healthcare needs, including those with intellectual, emotional, developmental, sensory or physical impairments, constitute a significant and vulnerable population, particularly in terms of health outcomes [1]. These conditions, such as Down syndrome, seizure disorders, hearing and vision impairments, and craniofacial anomalies, often lead to functional limitations that complicate the management of secondary health conditions, including oral diseases [2, 3]. Chronic dental conditions like caries and periodontal disease further compound the challenges faced by these individuals, resulting in a disproportionately high prevalence of oral health problems within this group [4, 5].

Studies have consistently shown that children with special needs experience multiple barriers to accessing adequate dental care [2, 3]. These barriers are not limited to the patient level, such as communication difficulties, heightened anxiety, sensory sensitivities, and limited cooperation, which can complicate the provision of traditional dental treatments. There are also significant systemic and provider-related barriers. A notable shortage of pediatric specialists, along with insufficient professional training and knowledge in handling special needs patients, limits access to appropriate care. As a result, individuals with disabilities often require specialized and personalized dental care tailored to their unique needs [6]. Despite significant advancements in dental care and treatment modalities, dental caries remains a major public health

issue, affecting 60–90% of children and adults worldwide [7]. Children with special healthcare needs, however, are often at an even greater risk for dental caries due to a combination of medical, behavioral and socioeconomic factors. Study indicates that around 77–79% of children with intellectual and developmental disabilities, including those with Down syndrome and cerebral palsy, experience dental caries [8].

In the context of Saudi Arabia and the wider Middle East, research on the oral health status and dental care needs of children with disabilities remains limited. Although international studies have highlighted the disproportionate impact of dental caries on children with special healthcare needs, there is a notable gap in data from this region [8–11]. Furthermore, there is a critical need for effective, individualized caries risk assessment models, such as the CAMBRA protocol, specifically tailored to children with special needs [12, 13]. This approach is crucial for managing and preventing dental caries progression while ensuring cost-effective, patient-centered care. Traditional one-size-fits-all approaches may not be sufficient for this population, given their unique dental and health needs.

Behavior management techniques (BMTs) also play a pivotal role in enhancing the dental experience and oral health outcomes for children with disabilities [14]. Pharmacological (Nitrous oxide, conscious sedation and General anesthesia) and Non-pharmacological strategies like desensitization, behavior shaping and communication aids are often necessary to reduce fear and anxiety, enabling these children to actively engage in dental care [14, 15]. Despite the increasing recognition of BMTs, there remains a significant research gap regarding their use and effectiveness in dental care for children with special needs, particularly in Saudi Arabia. Importantly, the success of BMTs often hinges on parental acceptance and consent, as parents are key decision-makers in the treatment plans for their children [16]. It is hypothesized that children with special healthcare needs in Saudi Arabia will exhibit a high prevalence of dental caries and be categorized predominantly within the high-risk group as per the CAMBRA assessment. Additionally, it is anticipated that children whose parents have higher education levels will have lower caries risk, and that non-invasive BMTs, such as distraction and positive reinforcement, will be more widely accepted by parents compared to physical restraint methods. Understanding both the clinical and behavioral aspects of dental care in this population is critical for improving health outcomes and enhancing the quality of care provided to this vulnerable group.

Given these considerations, this study aims to fill an important gap in the literature by examining the oral health status and caries risk of children with special healthcare needs in Saudi Arabia, using the CAMBRA protocol for risk assessment. Additionally, the study will explore the acceptance of various behavior management techniques by parents of children with special healthcare needs, as their approval is essential for the successful implementation of these techniques during dental treatment.

2. Materials and methods

This cross-sectional study was conducted in College of Dentistry, Jouf University, Saudi Arabia, between August and September 2024. The study utilized a non-probability convenience sampling technique to recruit participants. The target population included children with special healthcare needs and their parents/guardians who visited the Dental Clinics at the college of dentistry Jouf University for dental treatment during the study period. These children and their parents were from different schools in Al Jouf region, they were invited to participate through dental camps and dental education activities conducted at these schools.

The study included children aged 6 to 17 years with hearing, visual, or intellectual disabilities, along with their parents or guardians, who consented to participate. Parents were required to watch a brief video demonstrating various behavior management techniques (BMTs) as part of the study. Children with other types of disabilities (autism, cerebral palsy, or other neurological and developmental disorders) and those whose parents or guardians declined to provide consent were excluded from the study.

The sample size for this study was calculated based on the prevalence of dental caries reported in a previous study conducted in the United Arab Emirates (UAE), where 85.2% of children with special healthcare needs were found to have caries [6]. With a margin of error of 5%, a confidence level of 90%, and a prevalence rate ($p = 0.852$), the minimum required sample size was calculated to be 137 children. This sample size ensures sufficient power to meet the study objectives.

Ethical approval for the study was obtained from the local committee of bioethics at Jouf University (Ref: 07-06-43). Written informed consent was obtained from all participants who were able to comprehend the study's purpose. For minors and individuals with cognitive impairments, consent was provided by their parents or legal guardians.

All children underwent thorough intraoral examinations and bitewing radiographs to assess their oral health status, particularly for the detection of caries. A trained investigator completed a sociodemographic questionnaire for each child. The oral examinations were conducted under standardized conditions, using appropriate lighting and equipment, with the children positioned in a reclined chair. Parents or guardians assisted with communication when necessary. To ensure reliability, two calibration sessions were held for the examiners. Inter-examiner reliability was assessed using Kappa statistics, with a Kappa value of $\geq$0.75 considered acceptable for participation in the study. The decayed, extracted, and filled teeth (deft) index was used to assess caries experience in primary teeth, and the Decayed, Missing, and Filled Teeth (DMFT) index was used for permanent teeth [17]. These scores were recorded separately for each child. To report a single combined mean for the study, we calculate the average across all children, whether they have only primary teeth, only permanent teeth, or a mix ($Mean\ DMFT/deft = \frac{Total\ DMFT + Total\ deft}{Total\ number\ of\ children}$) [18].

Oral health behaviors were assessed through questions on the frequency of tooth brushing (once, twice or more), regular dental check-ups in the past year, and the child's ability

to brush independently. Caries risk was evaluated using a customized Caries Management by Risk Assessment (CAMBRA) tool, which classified participants into low, moderate, or high-risk groups [19]. The tool assessed risk factors such as plaque presence, fluoride use, dental care history and salivary function. The CAMBRA protocol is a risk-based approach for managing and preventing dental caries, focused on identifying individual risk factors (Past Caries Experience, Oral Hygiene Practices, Dietary Habits, Medical and Salivary Factors) protective factors (Fluoride Exposure, Regular Dental Visits) and patient behaviors (oral hygiene behaviors, dietary habits and lifestyle factors) that contribute to caries development. CAMBRA evaluates caries risk by examining biological, environmental and behavioral factors to create a personalized management plan. Some factors, such as bacterial counts, were excluded due to financial and logistical constraints.

A validated questionnaire adapted from Mahmoud Alammouri (2006) was used to assess parents' acceptance of various BMTs [16]. The questionnaire was reviewed and validated by an expert panel comprising four faculty members (two in Pediatric Dentistry, one in Psychology, and one in Dental Public Health). Feedback from the panel was incorporated into the final version of the questionnaire. The internal consistency of the questionnaire was assessed using Cronbach's alpha, yielding a coefficient of 0.83, indicating strong reliability. Parents were shown a 10-minute educational video demonstrating different BMTs, including Tell-Show-Do (TSD), Positive Reinforcement (PR), Nonverbal Communication (NC), Voice Control (VC), Parent Separation (PS), Distraction (Dis.), Hand-Over-Mouth (HOM), Physical Restraint (PhR), Hypnosis (Hyp), Nitrous Oxide Sedation (NO), Conscious Sedation (CS) and General Anesthesia (GA). The video provided structured demonstrations of these techniques to facilitate understanding and informed responses from parents. The questionnaire consisted of two parts: (1) sociodemographic information (*e.g.*, age, education level of parents), and (2) parental acceptability of each BMT, measured through 12 yes/no questions.

Descriptive statistics were used to summarize data, including frequency distributions for categorical variables. The association between caries status, oral health behaviors, and sociodemographic factors was assessed using ANOVA and Chi-square tests. Similar analyses were performed to evaluate the relationship between caries risk groups and sociodemographic factors. All statistical analyses were conducted using IBM SPSS version 25.0 (IBM-SPSS Corp, Armonk, NY, USA), with a significance level set at $p < 0.05$.

3. Results

A total of 137 children with special healthcare needs were included in the study. The distribution of disabilities among the participants was as follows: 52.6% had an intellectual disability, including Down syndrome; 32.8% had hearing loss; and 14.6% had visual impairment. The majority of the children were male (63.5%). The highest proportion of children (40.9%) belonged to the 10–13 age group. Among the parents, most were between 30–41 years old (39.4%), and the majority had completed college or higher education (87.5%) (Table 1).

TABLE 1. Sociodemographic characteristics of the participants (N = 137).

Variable	N (%)
Age of child (yr)	
6–9	38 (27.7)
10–13	56 (40.9)
14–17	43 (31.4)
Age of parents	
18–29	40 (29.2)
30–41	54 (39.4)
>41	43 (31.4)
Gender of child	
Male	87 (63.5)
Female	50 (36.5)
Education of parents	
No formal	2 (1.5)
School	15 (10.9)
College	95 (69.3)
University	25 (18.2)
Disability of children	
Hearing loss	45 (32.8)
Visual impairment	20 (14.6)
Intellectual Disability (ID)	72 (52.6)

As shown in Table 2, a significant association was found between the DMFT score and both the education level of parents and the type of disability of the children ($p < 0.05$). Children whose parents had a higher education level had a lower mean DMFT score (Mean = 5.0, Standard deviation (SD) = 1.48), while children with visual impairments had the highest mean DMFT score (Mean = 7.1, SD = 1.78) compared to those with other disabilities.

Most children with special needs presented with one or more disease indicators, with the most common being visible cavities (96.3%) and radiographic proximal enamel lesions (78.8%). The most frequently reported caries risk factor was frequent snacking (64.2%). In terms of protective factors, the majority of children resided in communities with fluoridated water (62.7%), and 54.7% used fluoridated toothpaste at least once a day (Table 3).

Table 4 presents the association between caries risk groups and sociodemographic factors. The majority of participants (71.5%) were found to be in the high risk category and only (28.5%) were in the moderate category of caries risk assessment, none were assessed in the low caries risk category. The only significant association observed was between the parents' education level and the child's caries risk group ($p < 0.05$). Children whose parents had only a school-level education were significantly more likely to be in the high caries risk group (93.3%).

TABLE 2. The response of oral health status, oral health behaviors and its association with sociodemographic characteristics.

	DMFT Mean (SD)	Frequency of tooth brushing N (%)				Visit to a dentist for a checkup N (%)		Able to brush independently N (%)	
	5.9 (1.62)	Once 81 (59.1)	Twice 42 (30.7)	Thrice 7 (5.1)	No brush 7 (5.1)	Yes 62 (45.3)	No 75 (54.7)	Yes 91 (66.4)	No 46 (33.6)
Age of child (yr)									
6–9	5.8 (1.41)	21 (25.9)	12 (28.6)	3 (42.9)	2 (28.6)	20 (32.3)	18 (24.0)	25 (27.5)	13 (28.3)
10–13	6.0 (1.55)	32 (39.5)	16 (38.1)	4 (57.1)	4 (57.1)	20 (32.3)	36 (48.0)	37 (40.7)	19 (41.3)
14–17	5.9 (1.58)	28 (34.6)	14 (33.3)	0	1 (14.3)	22 (35.5)	21 (28.0)	29 (31.9)	14 (30.4)
p-value	0.728		0.561			0.174		0.985	
Age of parents									
18–29	5.8 (1.28)	24 (29.6)	13 (31.0)	3 (42.9)	0	19 (30.6)	21 (28.0)	28 (30.8)	12 (26.1)
30–41	6.1 (1.62)	33 (40.7)	16 (38.1)	3 (42.9)	2 (28.6)	21 (33.9)	33 (44.0)	37 (40.7)	17 (37.0)
>41	5.9 (1.60)	24 (29.6)	13 (31.0)	1 (14.3)	5 (71.4)	22 (35.5)	21 (28.0)	26 (28.6)	17 (37.0)
p-value	0.562		0.309			0.456		0.600	
Gender of child									
Male	6.0 (1.52)	52 (64.2)	24 (57.1)	5 (71.4)	6 (85.7)	35 (56.5)	52 (69.3)	56 (61.5)	31 (67.4)
Female	5.8 (1.51)	29 (35.8)	18 (42.9)	2 (28.6)	1 (14.3)	27 (43.5)	23 (30.7)	35 (38.5)	15 (32.6)
p-value	0.342		0.488			0.119		0.502	
Education of parents									
No formal	6.5 (2.12)	2 (2.5)	0	0	0	2 (3.2)	0	0	2 (4.3)
School	6.3 (1.63)	8 (9.9)	5 (11.9)	0	2 (28.6)	6 (9.7)	9 (12.0)	9 (9.9)	6 (13.0)
College	6.1 (1.59)	56 (69.1)	28 (66.7)	6 (85.7)	5 (71.4)	43 (69.4)	52 (69.3)	69 (75.8)	26 (56.5)
University	5.0 (1.48)	15 (18.5)	9 (21.4)	1 (14.3)	0	11 (17.7)	14 (18.7)	13 (14.3)	12 (26.1)
p-value	0.018		0.725			0.457		0.042	
Disability of children									
Hearing loss	5.6 (1.65)	25 (30.9)	14 (33.3)	2 (28.6)	4 (57.1)	21 (33.9)	24 (32.0)	33 (36.3)	12 (26.1)
Visual impairment	7.1 (1.78)	14 (17.3)	5 (11.9)	0	1 (14.3)	6 (9.7)	14 (18.7)	10 (11.0)	10 (21.7)
Intellectual Disability (ID)	5.7 (1.40)	42 (51.9)	23 (54.8)	5 (71.4)	2 (28.6)	35 (56.5)	37 (49.3)	48 (52.7)	24 (52.6)
p-value	0.001		0.634			0.326		0.184	

DMFT: Decayed, Missing, and Filled Teeth; SD: standard deviation.

TABLE 3. Distribution of study participants according to disease indicators, risk and protective factors.

Disease Indicators	Saudi Arabia N (%)
Visible cavities or radiographic penetration of the dentin	132 (96.3)
Radiographic approximal enamel lesions (not in dentin)	108 (78.8)
White spots on smooth surfaces	89 (64.9)
Restorations in last three years	98 (71.5)
Risk Factors	
Visible heavy plaque on teeth	76 (55.4)
Frequent snack (>3 daily between meals)	88 (64.2)
Deep pits and fissures	67 (48.9)
Recreational drug use	0
Inadequate saliva flow by observation	49 (35.7)

TABLE 3. Continued.

Disease Indicators	Saudi Arabia N (%)
Saliva reducing factors (medications/radiation/systemic)	51 (37.2)
Exposed roots	26 (18.9)
Orthodontic appliances	35 (25.5)
Protective Factors	
Home/work/school is a fluoridated community	86 (62.7)
Fluoride toothpaste at least once daily	75 (54.7)
Fluoride toothpaste at least 2 daily	39 (28.4)
Fluoride mouth rinse (0.05% NaF) daily	31 (22.6)
Fluoride varnish in last six months	16 (11.6)
Chlorhexidine prescribed/used one week each of last six months	9 (6.5)
Xylitol gum/lozenges 4 daily last six months	6 (4.3)
Calcium and phosphate paste during last six months	3 (2.1)

NaF: Sodium fluoride.

TABLE 4. Sociodemographic characteristics-wise comparison of caries risk.

Variable	Caries Risk		*p*-Value
	Moderate N (%)	High N (%)	
	39 (28.5)	98 (71.5)	
Age of child (yr)			
6–9	13 (34.2)	25 (65.8)	
10–13	11 (19.6)	45 (80.4)	0.163
14–17	15 (34.9)	28 (65.1)	
Age of parents			
18–29	12 (30.0)	28 (70.0)	
30–41	10 (18.5)	44 (81.5)	0.072
>41	17 (39.5)	26 (60.5)	
Gender of child			
Male	22 (25.3)	65 (74.7)	0.277
Female	17 (34.0)	33 (66.0)	
Education of parents			
No formal	2 (0.0)	0	
School	1 (6.7)	14 (93.3)	0.029
College	28 (28.9)	69 (71.1)	
University	8 (34.8)	15 (65.2)	
Disability of children			
Hearing loss	16 (35.6)	29 (64.4)	
Blind	4 (20.0)	16 (80.0)	0.374
ID, Down Syndrome	19 (26.4)	53 (73.6)	

ID: Intellectual Disability.

Parental acceptance of various behavior management techniques (BMTs) for their children's dental treatment is presented in Table 5. The three most accepted techniques were Distraction (81.0%), Positive Reinforcement (77.4%), and Nitrous Oxide Sedation (65.6%). The least favored techniques were Hand-Over-Mouth (1.45%), Parent Separation (9.4%) and Physical Restraint (13.9%). However, none of the techniques received 100% acceptance or rejection from all parents.

4. Discussion

This study aimed to assess the caries status, caries risk, and parental acceptance of behavior management techniques (BMTs) used in the dental care of children with special

TABLE 5. The response of participants to various BMTs.

Technique	Responses	
	YES N (%)	NO N (%)
Tell-Show-Do (TSD)	81 (59.1)	56 (40.9)
Positive Reinforcement (PR)	106 (77.4)	31 (22.6)
Nonverbal Communication (NC)	77 (56.2)	60 (43.8)
Voice Control (VC)	48 (35.0)	89 (65.0)
Parent Separation (PS)	13 (9.4)	124 (90.5)
Distraction (Dis.)	111 (81.0)	26 (19.0)
Hand-Over-Mouth (HOM)	2 (1.4)	135 (98.5)
Physical Restraints (PhR)	19 (13.9)	118 (86.1)
Hypnosis (Hyp)	75 (54.7)	62 (45.3)
Nitrous Oxide Sedation (NO)	90 (65.6)	47 (34.3)
Conscious Sedation (CS)	86 (62.8)	51 (37.2)
General Anesthesia (GA)	79 (57.6)	58 (42.3)

healthcare needs in Saudi Arabia. The findings revealed a high prevalence of caries among children with special healthcare needs, aligning with existing literature on the disproportionate burden of oral health issues in this vulnerable population [2, 20].

The mean DMFT score among children with special healthcare needs in this study was significantly associated with both parental education level and the type of disability. Children with lower parental education levels had higher DMFT scores, consistent with findings from previous studies that highlight the influence of socioeconomic factors on children's oral health [21, 22]. Similar studies in the UAE and Jordan also reported higher caries prevalence among children from less educated families [6, 23]. Interestingly, the caries risk was lower in children whose parents had a college or higher level of education. This finding parallels research from Brazil and Turkey, where parental education was found to be a significant protective factor against caries development [24, 25]. Educated parents may have better access to oral health resources, knowledge of preventive measures, and the means to provide their children with regular dental check-ups. Parental education plays a key role in encouraging preventive oral health habits and lowering the risk of dental caries in children. The higher mean DMFT score among children with visual impairment in our study could be attributed to several factors that may influence caries development in this group. Children with visual impairment often face challenges in performing effective oral hygiene practices due to limited visual feedback, and they may also encounter difficulties in accessing specialized dental care. Additionally, children with disabilities, including those with visual impairments, may experience behavioral and cognitive challenges that make it difficult for them to follow regular oral health practices, further increasing their risk for dental caries. Studies have shown that children with disabilities, particularly those with visual or intellectual impairments, tend to have poorer oral hygiene and higher rates of dental caries compared to their typically developing peers [6, 20].

The high caries risk observed among children with special healthcare needs in this study is consistent with other studies that have highlighted the challenges of maintaining adequate oral hygiene in this population [2, 26]. Frequent snacking, a key caries risk factor identified in our study, has been similarly noted in studies from the United States and Europe [27]. Additionally, the high prevalence of visible cavities (96.3%) and radiographic approximal enamel lesions (78.8%) similar to the findings of other countries, indicating a global trend of poor oral health among children with special needs and disabilities [12, 28]. The high caries risk observed among children with special needs in this study reflects both behavioral and systemic challenges. Cultural dietary habits play a significant role in caries prevalence. In countries with high sugar and low fiber dietary patterns, such as the United States and parts of the Middle East, caries risk is elevated. Conversely, countries like Sweden, where healthier snacks and structured oral health programs are more prevalent, report lower caries rates in children [2, 10]. For comparison, the mean DMFT scores for children without disabilities in Saudi Arabia typically range between 2.3 and 3.6, as reported in national surveys [20]. In our study, children with disabilities exhibited significantly higher mean DMFT scores, underscoring the compounded oral health challenges associated with disabilities. This highlights the need for targeted preventive strategies and dietary interventions tailored to the needs of children with disabilities.

In terms of behavior management techniques, the most accepted BMTs by parents in our study were Distraction, Positive Reinforcement, and Nitrous Oxide Sedation. This aligns with previous research that indicates the acceptability of non-invasive and pharmacological techniques in managing dental anxiety and behavior in children technique [29, 30]. Studies in the United States and Kuwait have similarly shown high parental approval for techniques that ease anxiety and promote a positive dental experience without excessive restraint or coercion [31, 32]. The acceptance of behavior management techniques is influenced by cultural, societal, and religious factors that shape parental attitudes toward specific methods.

Conversely, techniques such as Hand-Over-Mouth, Parent Separation and Physical Restraint were the least accepted. Similar findings from other studies have been reported where parents are generally averse to techniques that involve physical force or separation from their children during dental treatment [29, 33]. Notably, none of the techniques were unanimously accepted or rejected, highlighting the variability in parental preferences based on cultural, personal, and clinical factors. This underscores the need for individualized communication with parents when selecting BMTs for their children.

One of the strengths of this study is its focus on a population that is underrepresented in dental health research, particularly in the Middle East. The use of a validated tool (CAMBRA) for caries risk assessment and the inclusion of a variety of BMTs provides a comprehensive analysis of both clinical and behavioral aspects of dental care for children with special needs. Additionally, the study design allowed for a direct assessment of parental acceptance of BMTs through an educational video, ensuring informed responses.

Despite these strengths, there are several limitations to this study. First, the use of a convenience sampling method and study sample may not represent all children with special needs in Saudi Arabia, may limit the generalizability of the findings to the broader population of children with special needs in Saudi Arabia. Further research with a broader sample and probability sampling is required to generalize these results to the wider population. Second, the reliance on self-reported oral health behaviors from parents could introduce response bias, as parents may overestimate their child's adherence to recommended oral hygiene practices. Additionally, some risk factors, such as bacterial counts, were excluded from the CAMBRA assessment due to logistical constraints, which may limit the comprehensiveness of the caries risk evaluation.

In this study, several challenges were encountered, which need to be addressed to provide a clearer understanding of the limitations and context of our findings. One of the main challenges was participant recruitment. Due to the nature of the target population—children with special needs—recruiting a sufficiently large sample proved difficult. Many potential participants had other medical appointments or were located in remote areas, which made it hard to gather a representative sample. We also faced challenges in ensuring the consistency of data collection across different types of disabilities. Children with intellectual disabilities or sensory impairments, such as hearing loss, required additional time and assistance to complete the required assessments. To mitigate these challenges, we worked closely with parents/caregivers and healthcare professionals to ensure that the study was conducted in a way that accommodated the children's individual needs. We also implemented a flexible scheduling system to address logistical barriers.

Another challenge was the interpretation of dental radiographs, particularly in the case of children with Down syndrome. As these children often have unique anatomical features, such as a smaller oral cavity or a different eruption pattern, interpreting radiographs required extra caution. We used additional training for the radiographic staff to ensure accuracy and consistency in the diagnosis of dental conditions. Despite these challenges, we managed to collect reliable data on the oral health status and caries risk of children with special needs, using the CAMBRA protocol, which provided a comprehensive risk assessment.

Future research should aim to expand the sample size and include a more diverse population of children with special needs across different regions of Saudi Arabia. Longitudinal studies would be valuable in assessing changes in caries risk and oral health status over time. Additionally, further studies could explore the effectiveness of specific BMTs in improving dental outcomes for children with special needs, as well as investigate the impact of parental education interventions on caries prevention. Integrating advanced diagnostic tools and a broader range of risk factors into caries risk assessment protocols would also enhance the accuracy of future studies.

5. Conclusions

This study revealed that children with special needs in Saudi Arabia have a high prevalence of dental caries and are at significant risk, particularly those whose parents have lower education levels. Intellectual and visual impairments were associated with the highest caries levels, emphasizing the critical need for targeted oral health interventions. Parental acceptance of behavior management techniques (BMTs) varied, with non-invasive methods such as Distraction and Positive Reinforcement being the most favored, while physical restraint techniques were the least accepted. These findings underscore the importance of personalized, patient-centered care strategies for improving oral health outcomes in this vulnerable population.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study can be made available on request.

AUTHOR CONTRIBUTIONS

OK, FAC, MNB, TA, HA and FHK—collected the data and performed data analyses and wrote the first draft of the manuscript. FAC, KBS, YDS and AI—were involved in the conceptual development of this paper and provided feedback and revised the final manuscript. FAC, AKSA, MNB, AI and KADA—co-supervised the project and revised the final manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was conducted in accordance with the Declaration of Helsinki and ethical approval was taken from the local committee of bioethics at Jouf University (Ref: HAP-13-S-001). Moreover, written informed consent was taken from each participant before. For minors and individuals with cognitive impairments, consent was provided by their parents or legal guardians.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Currie J, Kahn R. Children with disabilities: introducing the issue. The Future of Children. 2012; 22: 3–11.
[2] Alamri H. Oral care for children with special healthcare needs in dentistry: a literature review. Journal of Clinical Medicine. 2022; 11: 5557.
[3] Chaudhary FA. Challenges of special care dentistry in Pakistan. Foundation University Journal of Dentistry. 2023; 3: 54–55.
[4] Salles PS, Tannure PN, Oliveira CA, Souza IP, Portela MB, Castro GF. Dental needs and management of children with special health care needs according to type of disability. Journal of Dentistry for Children. 2012; 79: 165–169.
[5] Chaudhary FA, Ahmad B, Bashir U. Dental health status and oral health behaviours of patients with facial burn in Pakistan. BMC Oral Health. 2019; 19: 127.
[6] Alkhabuli JOS, Essa EZ, Al-Zuhair AM, Jaber AA. Oral health status and treatment needs for children with special needs: a cross-sectional study. Brazilian Research in Pediatric Dentistry and Integrated Clinic. 2019; 19: e4877.
[7] Levine R, Stillman-Lowe CR. The scientific basis of oral health education. 8th edn. Springer: Berlin. 2019.
[8] Alwattban RR, Alkhudhayr LS, Al-Haj Ali SN, Farah RI. Oral health-related quality-of-life according to dental caries severity, body mass index and sociodemographic indicators in children with special health care needs. Journal of Clinical Medicine. 2021; 10: 4811.
[9] Mehta A, Gupta R, Mansoob S, Mansoori S. Assessment of oral health status of children with special needs in Delhi, India. South Brazilian Dentistry Journal. 2015; 12: 239–246.
[10] Ningrum V, Bakar A, Shieh TM, Shih YH. The oral health inequities between special needs children and normal children in asia: a systematic review and meta-analysis. Healthcare. 2021; 9: 410.
[11] Chaudhary FA, Ahmad B, Arjumand B, Alharkan HM. The association between economic status and religious identity with oral health disparities and inequalities around the world. Cureus. 2024; 16: e51917.
[12] Iqbal A, Khattak O, Chaudhary FA, Onazi MAA, Algarni HA, AlSharari T, *et al*. Caries risk assessment using the caries management by risk assessment (CAMBRA) protocol among the general population of Sakaka, Saudi Arabia—a cross-sectional study. International Journal of Environmental Research and Public Health. 2022; 19: 1215.
[13] Khattak O, Iqbal A, Chaudhary FA, Syed J, Alsharari T, Vundavalli S, *et al*. Evaluating a linkage between obesity and the occurrence of dental caries among school going children in Sakaka, Al Jouf, Kingdom of Saudi Arabia. PeerJ. 2022; 10: e13582.
[14] Cianetti S, Paglia L, Gatto R, Montedori A, Lupatelli E. Evidence of pharmacological and non-pharmacological interventions for the management of dental fear in paediatric dentistry: a systematic review protocol. BMJ Open. 2017; 7: e016043.
[15] Roberts JF, Curzon ME, Koch G, Martens LC. Review: behaviour management techniques in paediatric dentistry. European Archives of Paediatric Dentistry. 2010; 11: 166–174.
[16] Alammouri M. The attitude of parents toward behavior management techniques in pediatric dentistry. Journal of Clinical Pediatric Dentistry. 2006; 30: 310–313.
[17] World Health Organization. Oral health surveys: basic methods. 5th edn. World Health Organization: Geneva. 2013.
[18] Marshall J, Sheller B, Mancl L. Caries-risk assessment and caries status of children with autism. Pediatric Dentistry. 2010; 32: 69–75.
[19] Iqbal A, Siddiqui YD, Chaudhary FA, Abideen MZU, Hussain T, Arjumand B, *et al*. Caries risk assessment by caries management by risk assessment (CAMBRA) protocol among the general population of pakistan—a multicenter analytical study. PeerJ. 2024; 12: e16863.
[20] Al-Qahtani Z, Wyne AH. Caries experience and oral hygiene status of blind, deaf and mentally retarded female children in Riyadh, Saudi Arabia. Odontostomatol Trop. 2004; 27: 37–40.
[21] Shyama M, Al-Mutawa SA, Honkala S, Sugathan T, Honkala E. Oral hygiene and periodontal conditions in special needs children and young adults in Kuwait. Journal of Disability and Oral Health. 2000; 1: 13–19.
[22] Ellakany P, Madi M, Fouda SM, Ibrahim M, AlHumaid J. The effect of parental education and socioeconomic status on dental caries among saudi children. International Journal of Environmental Research and Public Health. 2021; 18: 11862.
[23] Malkawi Z, Albashaireh Z. Oral health status and treatment needs of residents at jerash center for welfare and rehabilitation. Journal of Disability and Oral Health. 2014; 15: 1.
[24] Ozer S, Sen Tunc E, Bayrak S, Egilmez T. Evaluation of certain risk factors for early childhood caries in Samsun, Turkey. European Journal of Paediatric Dentistry. 2011; 12: 103.
[25] Martins MT, Sardenberg F, Abreu MH, Vale MP, Paiva SM, Pordeus I. Factors associated with dental caries in Brazilian children: a multilevel approach. Community Dentistry and Oral Epidemiology. 2014; 42: 289–299.
[26] Chaudhary FA, Ahmad B, Sinor MZ. The severity of facial burns, dental caries, periodontal disease, and oral hygiene impact oral health-related quality of life of burns victims in Pakistan: a cross-sectional study. BMC Oral Health. 2021; 21: 570.
[27] Robertson MD, Schwendicke F, de Araujo MP, Radford JR, Harris JC, McGregor S, *et al*. Dental caries experience, care index and restorative index in children with learning diZsabilities and children without learning disabilities; a systematic review and meta-analysis. BMC Oral Health. 2019; 19: 146.
[28] Sudhir KM, Kanupuru KK, Fareed N, Mahesh P, Vandana K, Chaitra NT. CAMBRA as a tool for caries risk prediction among 12- to 13-year-old institutionalised children—a longitudinal follow-up study. Oral Health and Preventive Dentistry. 2016; 14: 355–362.
[29] Al Zoubi L, Schmoeckel J, Mustafa Ali M, Splieth C. Parental acceptance of advanced behaviour management techniques in paediatric dentistry in families with different cultural background. European Archives of Paediatric Dentistry. 2021; 22: 707–713.
[30] Rai NK, Tiwari T. Parental factors influencing the development of early childhood caries in developing nations: a systematic review. Frontiers in Public Health. 2018; 6: 64.
[31] Muhammad S, Shyama M, Al-Mutawa SA. Parental attitude toward behavioral management techniques in dental practice with schoolchildren in Kuwait. Medical Principles and Practice. 2011; 20: 350–355.
[32] Eaton JJ, McTigue DJ, Fields HW, Beck FM. Attitudes of contemporary parents toward behavior management techniques used in pediatric dentistry. Pediatric Dentistry. 2005; 27: 107–113.
[33] Kumar MS, Aravinth V, Chenchugopal M, Elangovan A, Thomas A, Aishwarya V, *et al*. Assessing the attitude of parents towards various behaviour management techniques used during paediatric dental treatment: a cross-sectional study. Journal of Clinical and Diagnostic Research. 2021; 15: 35.

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