



Early childhood caries as a social issue: Findings of a local epidemiological study

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Abstract. Early childhood caries is one of the most prevalent dental conditions affecting young children; however, the lack of up-to-date epidemiological data for Kyrgyzstan hampers the planning of effective preventive measures and the development of targeted preventive programmes. The aim of this study was to investigate the prevalence of early childhood caries among children aged 1-3 years in the city of Bishkek and to identify the key socio-behavioural risk factors. A cross-sectional epidemiological study was conducted involving 250 preschool children, of whom 104 met the inclusion criteria and comprised the target subgroup. Dental examinations were performed according to the World Health Organisation diagnostic criteria. Caries status was assessed using the decayed primary teeth index, the number of affected primary tooth surfaces, and the Fedorov-Volodkina oral hygiene index. In addition, parents completed a questionnaire covering oral hygiene practices, dietary habits, and dental attendance. The prevalence of early childhood caries was extremely high, reaching 76.2% among children aged 12-24 months and 91.1% among those aged 25-36 months. Both caries severity and poor oral hygiene increased with age. The principal risk factors identified were delayed initiation of regular toothbrushing, frequent consumption of sugary foods before bedtime, the absence of preventive dental visits, and limited parental awareness of the role of fluoride and the harmful effects of nocturnal feeding. Early childhood caries represents not only a clinical but also a social problem. Reducing its prevalence requires comprehensive family-centred preventive programmes, including early parental education on oral hygiene practices, the promotion of good oral health habits, and improved access to paediatric dental care. The findings of this study may be used to inform the development of preventive strategies and educational programmes for parents aimed at reducing the prevalence of early childhood caries in young children

Keywords: epidemiology; risk factors; prevention; paediatric dental care; oral hygiene

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Introduction

Early childhood caries (ECC) is a rapidly progressing disease affecting the primary dentition of children under three years of age and is one of the most prevalent oral diseases in early childhood. The condition adversely affects not only oral health but also the child's overall well-being, contributing to pain, impaired nutrition, sleep disturbances, delayed speech development, and a reduced quality of life. The high prevalence of early childhood caries, its considerable medical and social consequences, and its preventability through timely preventive interventions highlight the importance of further research aimed at identifying risk factors and improving preventive strategies.

A review of the contemporary scientific literature indicates that early childhood caries remains one of the most significant challenges in paediatric dentistry, with its prevalence being determined by a combination of biological, behavioural, and socioeconomic factors. S. Sheikh *et al.* [1] conducted a comparative analysis of caries prevalence among children in Kyrgyzstan and India. The authors compared epidemiological indicators in the two countries and concluded that caries prevalence remained high in both populations despite differences in living conditions and healthcare systems. They emphasised the need to develop national preventive programmes that take regional characteristics and local risk factors into account. O.M. Davydyan *et al.* [2] analysed the results of preventive medical examinations of infants and preschool children in Russia to assess the prevalence, severity, and clinical characteristics of dental caries. They reported a high prevalence of the disease from an early age, observed an increase in caries severity as children grew older, and highlighted the importance of early diagnosis, regular preventive examinations, and timely preventive interventions.

In the study by S.B. Daminova *et al.* [3], the level of physicians' awareness of risk factors for dental caries in children was evaluated. The questionnaire survey revealed insufficient knowledge among healthcare professionals regarding disease prevention, and the authors concluded that improving professional education should be regarded as an important component of early childhood caries prevention. In the publication by M.D.O. Cunicelli [4], contemporary approaches to reducing the prevalence of early childhood caries through interventions targeting parents and other caregivers were reviewed. The author concluded that educating parents about appropriate feeding practices, oral hygiene, and timely utilisation of dental services can substantially reduce the risk of disease development, particularly when preventive measures are initiated during the first years of a child's life.

In its Global Report on Oral Health, the World Health Organization [5] presented an analysis of the global burden of oral diseases and outlined the main directions for the development of the dental care system

up to 2030. The document emphasises that the prevention of oral diseases must be integrated into the primary healthcare system, and that priority should be given to early intervention, reducing inequalities in access to dental services, and implementing comprehensive prevention programmes. A. Maklennan *et al.* [6] conducted a systematic review and meta-analysis on the global prevalence of early childhood caries and its association with socio-economic indicators. The authors summarised the results of numerous studies and found that the average prevalence of the condition remains high worldwide, and that the risk of developing it is statistically associated with household income, parental education, employment and other socio-economic factors. The study by H.H. Yang *et al.* [7] analysed the global, regional and national burden of primary tooth caries for the period from 1990 to 2021, with projections up to 2035. The authors demonstrated that the condition remains one of the leading causes of poor oral health in children, and that a further increase in the number of cases is expected in a number of regions worldwide, confirming the need to strengthen preventive measures.

In a systematic review and meta-analysis by S.E. Uribe *et al.* [8] assessed the global prevalence of early childhood caries based on World Health Organisation criteria. The authors confirmed the significant prevalence of the disease across all regions of the world and noted substantial differences between countries, linked to dietary patterns, hygiene habits, socio-economic conditions and the organisation of preventive dental care. The findings highlight the need to develop comprehensive prevention programmes that take into account both medical and social risk factors. Equally important is the issue of access to dental care. In rural areas of Kyrgyzstan and Uzbekistan, dental services for young children are virtually inaccessible, which exacerbates the problem. In such circumstances, prevention must be integrated into the primary healthcare system, and paediatricians and family doctors must play a key role in the early detection and prevention of dental caries. Viewed more broadly, early childhood caries can be regarded as an indicator of a society's social well-being. The high prevalence of the condition in CIS countries reflects the insufficient effectiveness of existing prevention programmes and low levels of parental awareness. Given limited resources, family-oriented approaches, educational initiatives and improved access to dental care prove to be the most effective. Furthermore, it is important to take into account the cultural and behavioural characteristics of the region. In Kyrgyzstan and neighbouring countries, traditions of prolonged breastfeeding and night-time feeding persist, which, in the absence of good oral hygiene habits, increases the risk of developing caries. In Russia and Uzbekistan, studies show that parents often start brushing their children's

teeth too late, and the level of dental literacy remains low [2,3]. This underscores the importance of educational programmes that instil good habits from the very first months of a child's life.

Early childhood caries should therefore be viewed as a complex problem encompassing clinical, social, cultural and organisational aspects. Addressing this problem requires an interdisciplinary approach, bringing together the efforts of dentists, paediatricians, educators and public health specialists. The aim of this study was to assess the prevalence of early childhood caries among children aged 1-3 years in the city of Bishkek and to identify the principal socio-behavioural risk factors associated with the development of the disease.

Materials and Methods

The present study was designed as a cross-sectional epidemiological investigation using a cluster sampling design. This approach provides representative data on the oral health status of children under resource-limited conditions and facilitates comparison with international studies. The study was conducted in preschool institutions in the city of Bishkek in 2025. A total of 250 children aged under 6 years were screened. For detailed analysis, a target subgroup of 104 children aged 12-36 months was selected, corresponding to the age range for early childhood caries. The inclusion criteria were: children aged 12-36 months; written informed consent provided by parents or legal guardians; attendance at a preschool institution in Bishkek; and the absence of severe systemic diseases that could preclude a dental examination. The exclusion criteria were: age over 36 months (for the main analytical subgroup); parental refusal to participate; the presence of systemic diseases or conditions affecting craniofacial or dental development (e.g. congenital anomalies or severe endocrine disorders); and incomplete or unreliable parental questionnaires. For the analysis of early childhood caries prevalence, the children were divided into two age groups: 12-24 months and 25-36 months. This approach enabled the identification of age-related patterns in the development of dental caries and the assessment of changes in disease indicators according to age. In addition, the overall prevalence of early childhood caries was calculated for the entire target subgroup of children aged 12-36 months to estimate the total burden of disease within the study population. Ethical considerations. The study was conducted following approval by the Bioethics Committee of the Kyrgyz State Medical Academy (Protocol No. 9, 2018), ensuring compliance with international ethical standards and the protection of participants' rights. All parents were informed of the study objectives and provided written informed consent for their children's participation. The study was carried out in accordance with the ethical principles of the World Medical Association [9].

Early childhood caries was diagnosed according to the diagnostic criteria of the World Health Organisation, ensuring comparability with international epidemiological studies [5]. Caries severity was assessed using the decayed primary teeth index and the number of affected primary tooth surfaces. Oral hygiene status was evaluated using the Fedorov-Volodkina Oral Hygiene Index, which provides an objective assessment of dental plaque accumulation and oral hygiene practices in young children. A standardised parental questionnaire, developed on the basis of contemporary epidemiological research, was used to identify socio-behavioural risk factors. The questionnaire included sections on the frequency and age at initiation of toothbrushing, dietary habits (including nocturnal feeding and the consumption of sugary foods), the frequency of dental visits, and parental knowledge of caries prevention and the role of fluoride-containing products.

Statistical analysis was performed using parametric methods. Continuous variables are presented as mean $\pm$ standard error ($M \pm m$), while proportions are presented as $P \pm m$. Statistical analyses were carried out using SPSS Statistics, version 25.0. Descriptive statistics were used to calculate frequencies and mean values for the variables of interest. The use of a cluster sampling design was justified by the need to account for the shared dietary and childcare environments within preschool institutions. The application of clearly defined inclusion and exclusion criteria enhanced the accuracy of the analysis by minimising the influence of systemic diseases on the study outcomes. Furthermore, the use of internationally recognised diagnostic criteria and oral health indices, together with the Fedorov-Volodkina Oral Hygiene Index, facilitates comparison with findings from other countries and enhances the relevance of the study for inclusion in the international scientific literature.

Results

During the initial stage of the epidemiological study, 250 preschool children underwent screening. Of these, 146 children were excluded from further analysis because they were older than 36 months, which did not meet the strict inclusion criteria for the investigation of early childhood caries. A detailed dental assessment and analysis of risk factors were not performed for the excluded group, as the study focused exclusively on the target subgroup of younger children ($n = 104$). The overall findings demonstrated that the disease was highly prevalent even at an early age. Moreover, the prevalence was considerably higher in the second age group than in the first. This indicates that, as children grow older and their primary teeth remain in function for a longer period, the risk of developing dental caries increases. Importantly, the differences between the groups were observed not only in disease prevalence but also in its severity: older children exhibited a greater

number of affected teeth and tooth surfaces, as well as more pronounced deficiencies in oral hygiene. The dental examination revealed a high prevalence of caries

affecting the primary dentition in the study population (Table 1). The overall mean prevalence of early childhood caries in the target subgroup was $84.6\% \pm 3.7$.

Table 1. Results of the analysis of children's dental examination data

Indicator	Group I	Group II
	12–24 months	25–36 months
Number of children (n)	42	62
Prevalence of ECC, % ($P \pm m$)	76.2 ± 6.5	91.1 ± 3.5
Decayed primary teeth index ($M \pm m$)	3.9 ± 0.29	5.6 ± 0.27
Number of affected surfaces, ($M \pm m$)	6.8 ± 0.45	11.3 ± 0.56
Fedorov-Volodkina index, ($M \pm m$)	2.4 ± 0.10	3.1 ± 0.4

Source: created by the authors

Analysis of the oral hygiene index revealed an unfavourable trend: in both age groups, the level of oral hygiene was unsatisfactory, although the situation was more pronounced among the older children. These findings support the hypothesis that the absence of early preventive measures leads to the rapid accumulation of carious lesions and progressive deterioration of oral hygiene. Further analysis of the quantitative indicators demonstrated a clear age-related increase in all examined dental parameters. The prevalence of early childhood caries among children aged 25-36 months exceeded that observed in the 12-24-month group by 14.9 percentage points (91.1% versus 76.2%), indicating a substantial increase in the proportion of children affected by caries during the second and third years of life. A similar pattern was observed in the assessment of caries severity. The mean decayed primary teeth index increased from 3.9 ± 0.29 to 5.6 ± 0.27 , representing an increase of approximately 43.6%. These findings indicate not only that a greater proportion of children developed caries but also that the disease progressed, affecting a larger number of primary teeth in each child within the older age group. Even more pronounced differences were observed in the number of affected tooth surfaces. The mean value increased from 6.8 ± 0.45 to 11.3 ± 0.56 , corresponding to an increase of approximately 66.2%. This trend indicates progression towards more extensive and multifocal forms of the disease, as the carious process involved not only a greater number of teeth but also a larger number of their surfaces. These findings reflect the rapid progression of early childhood caries in the absence of timely preventive and therapeutic interventions. Assessment of oral hygiene status also demonstrated a negative age-related trend. The mean Fedorov-Volodkina oral hygiene index increased from 2.4 ± 0.10 to 3.1 ± 0.40 , indicating a deterioration in the quality of individual oral hygiene among older children. Increased dental plaque accumulation creates favourable conditions for the prolonged activity of cariogenic microorganisms and the continuation of demineralisation processes in the enamel of primary teeth. Taken together, these findings indicate that by the age of 25-36 months there is not only a

marked increase in the prevalence of early childhood caries but also a substantial increase in disease severity. The concurrent rise in disease prevalence, the decayed primary teeth index, the number of affected tooth surfaces, and the deterioration in oral hygiene demonstrates the comprehensive progression of the pathological process. These findings emphasise the importance of initiating preventive measures from the eruption of the first primary teeth rather than waiting until the disease becomes clinically apparent. The graphical presentation of the data (Fig. 1) clearly demonstrates that the proportion of children with high levels of dental plaque accumulation increases with age.

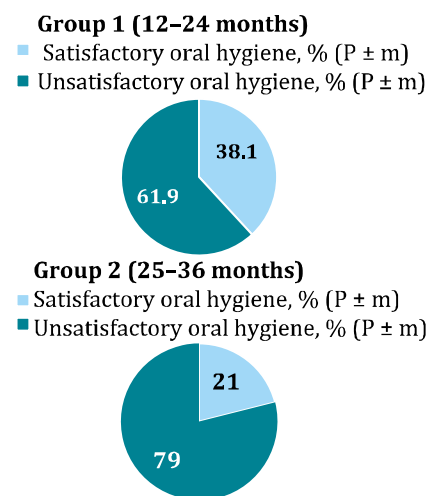


Figure 1. Percentage distribution of Fedorov-Volodkina oral hygiene index values

Source: created by the authors

A detailed analysis of the Fedorov-Volodkina oral hygiene index demonstrated a persistent unfavourable trend towards deterioration in oral hygiene status. In both study groups, the baseline level of oral hygiene was classified as unsatisfactory. However, the graphical distribution (Fig. 1) revealed a clear age-related pattern: as children progressed from the younger age group (12-24 months) to the older group (25-36 months), isolated instances of soft dental plaque

accumulation were replaced by widespread and dense plaque deposits covering multiple tooth surfaces. This trend supports the hypothesis that the absence of early oral hygiene practices leads to a rapid deterioration in oral health status. Based on the questionnaire findings, a diagram illustrating the behavioural and social risk factors associated with early childhood caries was constructed (Fig. 2).

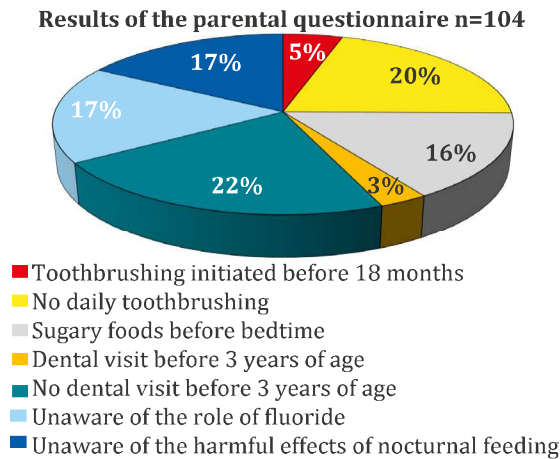


Figure 2. Questionnaire data

Source: reated by the authors

A detailed analysis of the questionnaire findings (Fig. 2) identified the principal socio-behavioural patterns contributing to the development of early childhood caries. Assessment of dietary habits indicated that most children were regularly exposed to cariogenic risk factors. In particular, frequent consumption of readily fermentable carbohydrates before bedtime and the continuation of nocturnal feeding were common practices, resulting in prolonged reductions in salivary pH during the night. These dietary behaviours were compounded by the delayed initiation of regular oral hygiene practices. The complete or partial absence of toothbrushing during the eruption of the primary dentition created favourable conditions for the colonisation of cariogenic microorganisms. The pattern of dental service utilisation among families was characterised by low engagement with preventive care and a predominance of problem-oriented visits, with preventive dental examinations during the first year of life being extremely uncommon. A substantial lack of parental knowledge was also identified, particularly regarding the caries-preventive role of fluoride in toothpaste and the risks associated with prolonged bottle feeding. As a result, many parents lacked sufficient information to establish appropriate oral hygiene habits or to seek preventive dental care in a timely manner. Even relatively simple behavioural changes, such as initiating toothbrushing at an earlier age and avoiding sugary foods before bedtime, could substantially reduce the risk of disease. Overall, the findings indicate that early

childhood caries is driven primarily by behavioural and social factors rather than by biological characteristics alone. Comparison of the two age groups showed that increasing age was associated not only with a higher prevalence of early childhood caries but also with a marked deterioration in oral hygiene. These findings support the view that preventive interventions should begin as early as possible, before the appearance of the first carious lesions. The high proportion of children consuming sugary foods before bedtime and lacking regular toothbrushing highlights the importance of behavioural risk factors. Inadequate parental awareness further amplifies the negative impact of these behaviours, creating conditions that favour the rapid progression of the disease.

Thus, the study findings demonstrate substantial progression of the carious process during early childhood and emphasise the importance of early preventive intervention. The results confirm that the interaction between biological factors (age and the extent of dental involvement) and social determinants (oral hygiene practices, dietary habits, and parental knowledge) creates a high risk of developing early childhood caries. The parental questionnaire, summarised in Figure 2, identified several important behavioural and social risk factors. Most children did not receive regular oral hygiene care, and toothbrushing was often introduced later than recommended. A considerable proportion of children consumed sugary foods before bedtime, creating favourable conditions for the development of dental caries. Preventive dental visits during the first years of life were uncommon, while parental awareness of the role of fluoride and the harmful effects of nocturnal feeding was found to be very limited.

Discussion

The results of the study confirmed the extremely high prevalence of early childhood caries (ECC) amongst children aged 1-3 years in Bishkek. Furthermore, a clear age-related trend was identified: in the older age group, the rates of incidence and prevalence of the condition were significantly higher. This indicates the rapid progression of the carious process in the absence of early preventive measures. M.S. Safarova & F.R. Kamalova [10] reported a prevalence of ECC of 78% among children under three years of age. Despite similar figures, the author notes that regular tooth brushing was more common than in Kyrgyzstan. This may explain the slightly lower caries intensity figures. Thus, the current findings confirm the significance of dietary habits in particular: in the Uzbek sample, fewer children were given sweets before bedtime, which reduced the risk of the disease.

In Belarus, P.A. Leus [11] demonstrated that a family's socio-economic circumstances directly influence the prevalence of caries. Children from low-income families had higher rates of the condition. In the

present study, similar patterns emerged due to low parental awareness and a lack of early visits to the dentist. A comparison with international data reveals interesting differences. M.M. van der Zande *et al.* [12] reported a prevalence of dental caries of around 60% among three-year-olds. This is lower than the figures obtained in this study, which the authors attribute to national prevention programmes involving compulsory visits to the dentist and the widespread use of fluoride-containing products. No such programmes exist in Kyrgyzstan, which explains the higher prevalence of the condition [13]. The findings of this article confirm this conclusion: a significant proportion of parents are unaware of the harm caused by night-time feeding, which contributes to the development of caries.

In South Korea, E. Ahn & S.M. Kim [14] noted that regular visits to the dentist before the age of three significantly reduce the risk of developing dental caries. In the current sample, only a handful of children had visited the dentist at an early age, which confirms the lack of a culture of preventive check-ups. Studies focusing on parental behaviour also support these findings. The study by A.E. Moca *et al.* [15] showed that differences between breastfeeding and bottle-feeding significantly influence the risk of ECC. In this study, such aspects were not analysed separately, but the high proportion of night-time feeds identified indirectly confirms the significance of this factor. A study by B.L. Edelstein *et al.* [16] showed that parental dietary behaviour (for example, frequent consumption of sweets within the family) correlates with the prevalence of dental caries in children. In India, studies have confirmed a close link between bottle-feeding, night-time feeds and high levels of ECC [17]. In the Middle East, a systematic review confirmed the significance of socio-economic and cultural risk factors, including parents' level of education and access to dental care [18]. In Turkey, a study showed that the prevalence of ECC in children aged 2-5 years is around 69%, identifying low parental educational attainment and the absence of regular preventive dental visits as the principal risk factors.

Recent research indicates that early childhood caries remains one of the most common non-communicable diseases in children, and that its development is determined by the complex interplay of biological, behavioural and socio-economic factors. In a global review, N. Tinanoff *et al.* [19] analysed current data on the epidemiology, aetiology, risk factors, social burden, treatment approaches, prevention and educational programmes relating to early childhood caries. The authors concluded that effectively reducing the prevalence of the disease requires comprehensive prevention, early risk assessment and interdisciplinary collaboration among healthcare professionals. A study by M.O. Folayan [20] examined the relationship between early childhood caries and poverty levels in low- and middle-income countries. The authors found that

socio-economic conditions have a significant impact on the prevalence of the condition; however, this relationship is complex and depends on the specific characteristics of individual countries, which highlights the need to take social determinants of health into account when developing prevention programmes.

R.J. Schroth *et al.* [21] investigated the oral health status of indigenous children and the impact of early childhood caries on their general health and quality of life. The authors demonstrated that early childhood caries is associated with pain, as well as disruptions to children's eating habits, sleep, physical development and psychosocial well-being; they also emphasised the need for early preventive measures and improved access to dental care for vulnerable population groups. The publication by H. Benzian *et al.* [22] examines the significance of the World Health Organisation's Global Strategy for Oral Health as a foundation for improving dental care systems. The authors emphasised that integrating the prevention of dental diseases into the primary healthcare system, reducing inequalities in access to dental services, and implementing cross-sectoral policies are key prerequisites for improving the oral health of the population, including children. These findings confirm the universality of socio-economic risk factors and highlight the need for educational programmes for parents. In this study, similar patterns were evident in the high proportion of children who were given sweets before bedtime.

This leads to the conclusion that the findings confirm universal patterns: ECC develops under the influence of a combination of biological and social factors; family behavioural habits, particularly diet and oral hygiene, play a key role; and international experience shows that the implementation of national preventive programmes can significantly reduce the prevalence of the condition. For Kyrgyzstan, a pressing priority is the development of a comprehensive prevention strategy, including educational programmes for parents, the integration of dental care into the primary healthcare system, and improving access to fluoride-containing products. This study confirmed the high prevalence of dental caries and identified key socio-behavioural risk factors. A comparison with other countries has shown that the problem is universal in nature, but its severity depends on parents' level of awareness, cultural habits and the availability of dental care.

Conclusions

The present study demonstrated that early childhood caries (ECC) among children aged 1-3 years in Bishkek is characterised by an extremely high prevalence and severity. The highest values were observed in the older age group (25-36 months), indicating rapid disease progression during the first three years of life. This period may therefore be regarded as a critical stage in the establishment of persistent risk factors and the

foundations of lifelong oral health. The findings confirmed that the principal determinants of ECC are family-related socio-behavioural factors. Delayed initiation of regular oral hygiene, irregular or absent toothbrushing, frequent consumption of sugary foods before bedtime, failure to attend preventive dental visits, and limited parental knowledge of basic preventive measures create favourable conditions for the rapid development and progression of carious lesions. Collectively, these factors establish an environment that promotes both the onset and progression of the disease.

It is important to emphasise that ECC represents not only a clinical but also a social problem. It reflects the level of oral health literacy within the population, access to dental care, and cultural practices related to childcare. Consequently, the prevention of early childhood caries should be regarded as a public health priority requiring a multidisciplinary approach involving not only dentists but also paediatricians, educators, and social workers. The present findings highlight the need for comprehensive family-centred preventive programmes. Such programmes should include early parental education, the establishment of appropriate oral hygiene practices from infancy, management of dietary risk factors, and increased utilisation of preventive dental services. Particular emphasis should be placed on educational initiatives aimed at improving parental awareness of the role of fluoride, the harmful effects of nocturnal feeding, and the importance of regular dental examinations.

Future research should investigate in greater detail the influence of family socioeconomic conditions on the development of ECC and evaluate the effectiveness of

educational and preventive programmes adapted to the cultural characteristics of the region. Further studies should also examine the role of feeding practices, including prolonged breastfeeding and the use of feeding bottles containing sweetened liquids, to develop recommendations that reflect actual childcare practices. Overall, this study confirmed the high prevalence of early childhood caries and identified the principal socio-behavioural risk factors associated with its development. The implementation of family-centred preventive programmes has the potential not only to reduce the prevalence of ECC but also to promote lifelong healthy oral health behaviours, thereby contributing to improved oral health across the population.

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Conflict of Interest

None.

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