

Oral Health Status and Influence Factors of Childhood in Pre-Schools at Vientiane Capital, Lao PDR

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ABSTRACT

Background: Early childhood caries (ECC) is a serious oral health concern with high prevalence and a low treatment rate in Laos. Few studies have focused on preschool children. This study aimed to explore oral health and influencing factors of childhood caries in pre-schools in Vientiane, the capital of Lao PDR. The objectives of this study were to determine the prevalence of early childhood caries and oral health status in children ages 3-5 years old in Vientiane, the capital of Laos. This study aimed to assess the feeding practices, snack consumption, oral hygiene practices, and dental visits of children at this age.

Method: This is a cross-sectional descriptive study. The total number of children was 345 in eight pre-schools in Vientiane Capital. Data was collected by oral examination, and their caretakers were interviewed. Data analysis was carried out using a statistical package. Descriptive statistics were used to describe the oral health status.

Result: The prevalence of dental caries was 93.3% with a mean decayed, missing, and filled teeth (dmft)±SD of 7.1±3.96. Missing teeth were (mt=0.05), and the mean filled teeth (ft) was only 0.32. The teeth most affected by dental caries were the upper right and left central incisors, followed by the upper right and left lateral incisors, lower molars, upper molars, upper canines, lower canines, and the least affected were the lower right and left lateral incisors. Factors that affected dmft were tooth brushing frequency, brushing with parental assistance or supervision, the age when brushing started, feeding patterns, and the type of milk, candy, and sweet consumption.

Conclusion: The results of the study indicate that dental caries prevalence among 3-5 years old children is very high, and oral hygiene is very poor. Further prevention programs and more education to promote better health for young children in Lao P.D.R. are needed.

Keywords: Early Childhood Caries, Feeding Practice, Oral Hygiene, Lao PDR.

Introduction

The World Health Organization (WHO) identifies dental caries as a formidable global public health challenge, with a particularly high incidence among preschool-aged children. This burden is underscored by the elevated prevalence of decayed, missing, and filled teeth (DMFT) documented across Southeast Asia between 2005 and 2015 [1]. Early childhood caries (ECC) remains a critical international concern, as incidence rates continue to climb in developing regions. Notably, a high prevalence of primary tooth

decay has been observed among pediatric populations in Africa and Southeast Asian nations [2]. Consequently, oral healthcare and robust disease prevention strategies are indispensable components of health promotion, specifically for children in the formative 3-to-5-year age cohort [3].

Ranked by the WHO as the third most prevalent non-communicable chronic disease globally, dental caries necessitates rigorous attention regarding both prophylaxis and clinical intervention. Beyond oral health, the condition poses a substantial threat to a child's holistic growth and development, often precipitating severe systemic health complications [4].

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Preschoolers represent a cornerstone demographic for primary oral healthcare initiatives. Prioritizing intervention during these early years is a decisive factor in determining the long-term dental health trajectory of future generations [5]. In Southeast Asia, dental caries persists as a major public health priority [6]. As a largely preventable condition, early detection is paramount to mitigating pain and ensuring that children achieve their developmental milestones. The etiology of dental caries is multifactorial, involving an interplay of bacterial pathogens, dietary habits, child-rearing practices, environmental determinants, systemic pathologies, and the adverse effects of certain pharmacological treatments [7].

A survey conducted in Uganda revealed a dental caries prevalence as high as 88.6%. According to Musinguzi et al., the average dmft index (decayed, missing, and filled teeth) was recorded at 1.79 for 3-year-olds, 2.37 for 4-year-olds, and 1.91 for 5-year-olds [8]. Similarly, a 2015 study in Myanmar reported an overall caries prevalence of 82.9%, with mean dmft scores of 6.42 \pm 4.901. Specifically, 3-year-olds exhibited a prevalence of 87.9% (dmft 5.69 ± 4.66), while 4-year-olds reached 87.0% with an identical dmft mean. These figures underscore a significantly high disease burden within these pediatric cohorts [9].

Furthermore, research in Thailand encompassing both urban and rural populations indicated that while prevalence and mean dmft/DMFT scores had decreased across all age groups by 2012, they remained substantial. For 3-year-olds, the mean dmft was 2.7 with a prevalence of 51.7%, whereas children aged 5–6 years showed a mean dmft of 4.4 and a prevalence of 78.5% [10].

The Lao People's Democratic Republic (Lao PDR) is a landlocked nation situated in Southeast Asia, sharing borders with China, Myanmar, Vietnam, Cambodia, and Thailand. Currently classified as a lower-middle-income economy, the country faces significant public health challenges, particularly regarding oral health. Dental caries (tooth decay) remains a predominant concern, profoundly affecting the quality of life by interfering with essential daily activities such as nutrition and sleep. Moreover, dental distress is a leading driver of school absenteeism among the youth. In response, the National Oral Health Policy of Lao PDR has designated dental caries as a high-priority condition, emphasizing the promotion of oral hygiene behaviors as a cornerstone of its preventive strategy [11].

Despite these policy efforts, dental caries continues to be a major public health burden, with contemporary surveys indicating a rising prevalence, especially among pediatric populations. Data from the inaugural National Oral Health Survey in 1991 revealed that 67.3% of six-year-old children suffered from caries in their primary dentition a rate notably higher than that of other socioeconomic cohorts. While comprehensive data for younger demographics is vital for the strategic planning of preventive services, a significant gap in baseline information persists. Nevertheless, research from 2010 indicated that the prevalence of dental caries among preschool children aged 3–5 reached 82%, with an average dmft score of 5.5 [12].

Research Objectives

The primary objectives of this study are to investigate the prevalence of dental caries and the extent of dental plaque among kindergarten students in Vientiane Capital, Lao PDR. Furthermore,

the study aims to evaluate feeding patterns, oral hygiene practices, and the frequency of dental visits within this population.

Population and Sample

Population: This study employed a purposive sampling method, targeting children aged 3–5 years attending kindergartens across four districts in Vientiane Capital. The initial calculated sample size was 314 participants. To account for potential data collection errors or participant attrition, the sample was increased by 10% (31 participants), resulting in a final sample size of 345.

The population parameters were informed by the findings of Senesombath et al., who reported a 28.6% prevalence of dental caries in children [12]. To determine the required sample size for an unknown population, Cochran's (1953) formula was applied using the following variables:

$$n = \frac{p(1-p)z^2}{e^2}$$

n: The required sample size.

Z: The standard normal distribution value at a 95% confidence level (\alpha = 0.05), which is 1.96.

p: The estimated proportion of children with dental caries (0.286).

e: The margin of error (precision level) of 0.05.

Sample Group: This study involves a sample of children aged 3 to 5 years enrolled in public and private kindergartens. The participants were selected from four districts within the Vientiane municipality. The total population comprises 4,375 children across 47 institutions.

A multi-stage sampling method was employed as follows:

Stage 1: Two schools were randomly selected from each of the four districts.

Stage 2: The required sample size of students from each selected school was determined using the following formula:

$$n_s = \frac{n_p N_s}{N} n$$

The representative sample size of students for each school.

Nn = The total number of students in each specific kindergarten.

n p = Total sample size calculated according to the sample size calculation formula.

N = Total number of students from 8 schools.

Therefore, the number of students was determined for two schools, also both public and private were selected in each district is a total of 345 people, as detailed in the table below:

Table 1: Representative Simple Size for Each School

District	School	Population	Samble size
Xayseth district	Private school	560	44
	Public school	375	30
Sisattanak district	Private school	481	38
	Public school	594	47
Sikhottabong district	Private school	904	71

	Public school	427	34
Chanthabuly district	Private school	582	46
	Public school	452	35
Total		4375	345

Research Instruments

Quantitative Data: The primary instrument for quantitative data collection was a structured questionnaire, divided into two key sections: 1) Socio-demographic profiles of both guardians and children; and 2) Childcare behavioral assessments, specifically focusing on oral hygiene practices (e.g., gingival and dental cleaning) and patterns of dental service utilization.

Qualitative Data: Clinical dental examinations were conducted to assess oral health status, specifically focusing on dental caries, missing teeth, filled teeth (DMF index), and the prevalence of dental plaque. These assessments were performed via direct intraoral examination.

To ensure the rigor of the study, the initial draft of the questionnaire underwent a content validity assessment by a panel of three experts. The evaluation yielded an Item-Objective Congruence (IOC) index ranging from 0.67 to 1.00. Following the experts' feedback, the instrument was refined and finalized for large-scale data collection.

Data Collection

This study employed a mixed-methods approach for data collection.

Quantitative Phase: Questionnaires were administered to the parents of kindergarten students within the Vientiane Capital municipality. Participants were provided with comprehensive instructions to ensure data accuracy. The completion time per respondent was approximately 10–15 minutes, after which the surveys were systematically collected.

Qualitative Phase: The researcher conducted clinical oral examinations for each child. Observed clinical conditions and diagnostic findings were systematically recorded on individual dental charts to ensure detailed and precise data management. All information collected from questionnaires and results from physical oral examinations of children was analyzed using Statistical software SPSS version 22.0 was used to analyze percentages (%).

Results

Dental Caries Rate: The prevalence of dental caries was 93.3%. The mean dmft score was 7.1. ±3.96, which indicates a relatively high prevalence of dental caries among preschool children aged 3 to 5 years in Vientiane Capital. Furthermore, only 6.7% of the children were caries-free (Table 2).

Table 2: Prevalence of Dental Caries

Prevalent	Mean ±SD (teeth/person)				
	n (%)	dt	mt	ft	dmft
322(93.3%)	6.82±4.04	0.05±0.10	0.32±1.02	7.1±3.96	

It was found that 19.4% of 3 years old children had dental caries, while only 2.3% were caries-free. For 4 years olds, 33.6% had caries and 2.9% were caries-free. Among 5-year-olds, 40.3% had caries and only 1.4% were caries-free. The P-value was 0.098 (Table 3).

Table 3: Frequency Of Dental Caries by Age

Variable	Dental caries		COR	P-value
	Deycay (%)	None decay (%)		
3 years	67 (19.4)	8(2.3)		
4 years	116(33.6)	10(2.9)	.237**	.000
5 years	139(40.3)	5(1.4)		
Total	322(93.3)	23(6.7)		

** Correlation is significant at the 0.01

Distribution of dental caries in upper primary and lower teeth

It was found that the teeth affected by caries in the upper jaw are: tooth number 51 (76.6%), tooth number 61 (79.1%), tooth number 52 (57.4%), tooth number 62 (60.9%), tooth number 53 (22.9%), tooth number 63 (25.5%), tooth number 54 (21.2%), tooth number 65 (25.5%), tooth number 55 (30.4%), and tooth number 65 (38%).

When comparing the upper and lower jaws, it was observed that the occurrence of dental caries is higher in the upper jaw than in the lower jaw. For tooth numbers 71, 81, 72, 82 and 73, 83, the rate of dental caries is low; however, for tooth numbers 74, 84, 75, and 85, there are significantly different rates of dental caries (Table 4).

Table 4: Distribution Of Dental Caries in Upper Primary and Lower Teeth

Variable	Numberof cavities /teeth	Percentage (%)
Teeth of the upper jaw		
Tooth number 51	264	76.5
Tooth number 61	273	79.1
Tooth number 52	198	57.4
Tooth number 62	210	60.9
Tooth number 53	79	22.9
Tooth number 63	88	25.5
Tooth number 54	73	21.2
Tooth number 64	88	25.5
Tooth number 55	105	30.4
Tooth number 65	131	38.0
Teeth of the lower jaw		
Tooth number 71	6	1.7
Tooth number 81	6	1.7
Tooth number 72	4	1.2
Tooth number 82	3	0.9
Tooth number 73	13	3.8
Tooth number 83	16	4.6
Tooth number 74	170	49.3

Tooth number 84	173	50.1
Tooth number 75	226	65.5
Tooth number 85	226	65.5

Percentage of Filled Teeth: Upper vs. Lower Arches

As shown in Figure 4-3, the percentage of fillings in the upper left canines (2.3%) exceeded those in the upper posterior teeth. In contrast, the lower teeth showed a much higher frequency of fillings in the posterior section. On the lower left side, the filling rates for the first and second molars were 5.8% and 6.1%, while the corresponding molars on the lower right both showed a filling rate of 6.4%.

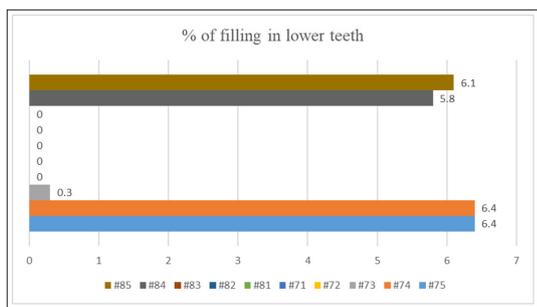
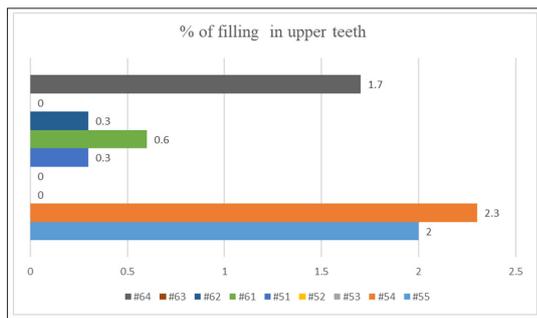


Figure 1&2: Percent of Filling in Upper and Lower Teeth

Oral hygiene of children

According to Table 5, out of 345 children, only 9.3% (n=32) maintained a plaque-free status, whereas a significant 90.7% (n=313) presented with dental plaque. These findings collectively indicate a high prevalence of poor oral hygiene among the surveyed children.

Table 5: Debris Score of Upper Incisor by Percent

Valuable	Number (n)	Percent
No plaque	32	9.3
Plaque	313	90.7
Total	345	100

Type of feeding

The result of the present study shows the higher proportion 87.8% of children had been breast feeding, 12.2% were bottle feeding. That shows most of children have been breast feeding. When they were newborn to one year. (Table 6).

Table 6: Number And Percentage of Children by Breastfed and Bottle Fed

Valuable	Number (n)	Percent
Breast feeding	303	87.8

Bottle feeding	42	12.2
Total	345	100

Frequency of Food Consumption by Age:

From Figure 2, it is shown that children who consume food three times a day are mostly infants under 1 year old (56.2%). Meanwhile, 29.6% of children aged 1 to 2 years consume food three times a day. For children aged 3 to 5 years, 11.6% consume food three times a day, and only 1.7% do not consume food three times a day.

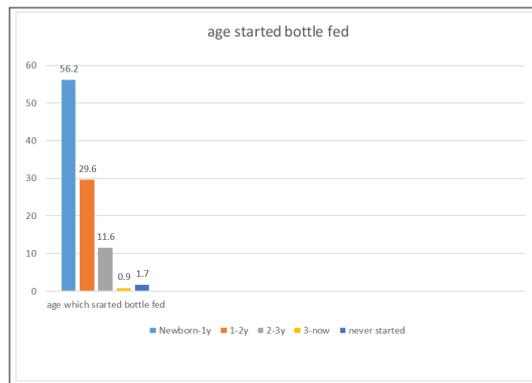


Figure 3: Percentage Of Children’s Age That Started Bottle Fed

Number of children with drink milk bottle feeding

The table 4-7 shows, 118 children were drinking sweet milk making 34.2%, children drink unsweet milk has 68 children making 19.7%, and most of children drink both (sweet milk and unsweet milk) it making 46.1%.

Table 7: Children Who Had Drink Milk Conception

Type of milk	n	Percent%
Sweet milk	118	34.2
Unsweet milk	68	19.7
Both	159	46.1
Total	345	100

Feeding pattern at night

Regarding children’s milk consumption at night, it was found that the proportion of children who fall asleep while bottle-feeding once a day is 27.8%. Those who fall asleep while bottle-feeding more than twice a day is 26.1%, while only 2.6% fall asleep while bottle-feeding more than three times a day. However, the majority of children, accounting for 43.5%, never fall asleep while bottle-feeding (Table 8).

Table 8: Children falling asleep while bottle feeding

which sleep with bottle	Number (n)	Percent (%)
1time/day	96	27.8
≥2 time/day	90	26.1
≥3 time/day	9	2.6
Never	150	43.5
Total	345	100

Frequency and percentage of children who stopped bottle feeding

The study shows that the proportion of children who stopped bottle feeding at more than 3 years of age is 16.2%. Meanwhile, 31.3% were children aged 2 to 3 years, and 21.4% stopped bottle feeding when they were 1 to 2 years old. Only 10.7% of children stopped feeding between the ages of 6 months and 1 year, while 20.3% of children have never stopped bottle feeding (Table 9).

Table 9: Frequency And Percentage of Children Who Stopped Bottle Feeding by Age

Age which stop bottle feeding	n	%
6m-1y	37	10.7
1-2y	74	21.4
2-3y	108	31.3
>3y	56	16.2
Not stop	70	20.3
Total	345	100

Oral Hygiene Practices

Child oral cleaning behavior by caregivers:

From the survey, it was found that 65.8% of caregivers cleaned the child’s gums before teeth erupted, while 34.2% had never cleaned the gums. Regarding tooth brushing frequency: 4.9% brushed more than 2 times a day. 47.8% brushed 2 times a day. 47.2% brushed once a day. Almost all children use a toothbrush, reaching 78%, while 1.6% have never used a toothbrush. Regarding cleaning after consuming sweets and sugary drinks: 46.4% of children do not clean their teeth regularly after consuming sweets and sugary drinks. 35.7% of caregivers never clean the child’s mouth [after sweets].18% of children clean their mouths regularly after consuming sweets and sugary drinks (Table 10).

Table 10: Prevalence Of Oral Hygiene Behavior

Variable	Total number	Percentage (%)
Clean child’s gums		
Yes	227	65.8%
No	118	34.2%
Frequency of tooth brush		
Once/day	163	47.2%
Twice/day	165	47.8%
>Twice/day	17	4.9%
Use tooth paste		
Yes	269	78%
Yes, but not regularly	67	19.4%
No	9	2.6%
Clean after taking candy and sweet beverages		
Yes	62	18%
Yes, but not regularly	160	46.4%
No	123	35.7%
Total	345	100%

Initiation of Oral Health Care for Children by Guardians

From Figure 4, it is shown that 55.4% of children started brushing their teeth between the ages of 1 to 2 years, 29.3% started between 6 months to 1 year, 8.1% started after the age of 3 years, and only 0.6% of children have never started brushing.

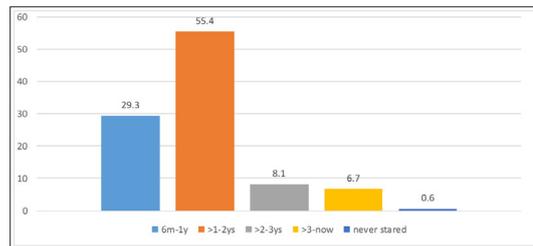


Figure 4: Initiation of Oral Health Care for Children by Guardians

It was found that 52.5% of children had their teeth brushed under the supervision of a guardian, 41.2% brushed their teeth themselves or with a guardian, and 6.4% brushed their teeth by themselves without guardian supervision (Table 11).

Table 11: The Children’s Tooth Brushing Under Caretaker Supervision

Variable	n	%
By caretaker	181	52.5
By him/her self with caretaker supervision	142	41.2
By him/her self without caretaker supervision	22	6.4
Total	345	100

Children’s Dental Visits

Regarding the first dental visit, the majority sought treatment due to toothache, accounting for only 39 people (11.3%). Visits for oral and dental check-ups accounted for 11.3%, and other reasons accounted for 1.7%. Beyond that, the percentage of those who had never visited a dentist was as high as 75.7%. Among 203 guardians, 58.8% had never received health education regarding oral health, while 41.2% had received such education. Children who received advice from a dentist regarding oral health care accounted for 54 people (15.7%), through journals 1.2%, social media 10.7%, television 12.2%, posters 1.2%, and other channels 0.3%. Additionally, those who had no information regarding oral health care amounted to 203 people (58.8%) (Table 12).

Table 12: Frequency and Percentage of Dental Visit and Oral Hygiene Care Education

	Number (n)	(%)
Reason for dental visit		
Check up	39	11.3
Toothache	39	11.3
Other...	6	1.7
Never went to	261	75.7
Oral hygiene care education		
Yes	142	41.2
No	203	58.8
Advice about oral hygiene		

Dentist	54	15.7
Magazine	4	1.2
Socio media	37	10.7
TV	42	12.2
Poster	4	1.2
Other	1	0.3
never	203	58.8
Total	345	100

Discussion

The results of this study show that the oral health and factors influencing it in preschool children aged 3 to 5 years are affected by dental caries (tooth decay), with a dmft score > 4. The prevalence rate of dental caries is as high as 93.3%.

This is consistent with a study in the Philippines among 5-year-old children, which found a prevalence of 94% and a dmft score of 9.8. However, the prevalence in this study is higher than in other studies within similar age groups in other countries: Saudi Arabia: 85% prevalence Vietnam: 89.1% prevalence Cambodia: 84.9% prevalence [13-15]

Similarly, previous surveys in Laos among preschool children found prevalence rates that were closely aligned. These surveys indicated that the teeth most severely affected were the upper front teeth (left and right), followed by the first and second molars, respectively [12].

In comparison with studies from several other countries, such as a study in Jordan, the prevalence rate of dental caries in 4-year-olds was 72.5% and 77.2% in 5-year-olds [16]. Meanwhile, the prevalence rate of dental caries in children aged 36–47 months was 82%, with an average dmft of 5.5, which represents a lower prevalence rate than that found in the current study [12].

The results of this study show that 29.3% of children have started brushing their teeth; however, it was also found that 0.6% have never brushed. Among them, 47.2% brush once a day, and 47.8% brush more than twice a day. Nevertheless, the rate of dental caries (cavities) remains high, which may be due to ineffective brushing techniques in preventing dental disease [17].

From the study results, it was found that the proportion of children who consume breast milk is as high as 87.8%. This was explained by the children's guardians, 11.6% of whom are housewives. 56.2% of them stated they began breastfeeding their children from birth until one year of age. This reason correlates with the occupation of guardians who work for the government at 20.6%.

A large number of children drink both sweetened and unsweetened milk at 46.1%, sweetened milk at 34.2%, and unsweetened milk at 19.7%. Children who sleep with a bottle in their mouth once a day and twice a day are at 27.8% and 26.1% respectively, while 43.5% never sleep with a bottle in their mouth.

A large number of children stopped bottle-feeding when they reached 2–3 years of age (31.3%), 21.4% stopped at 1–2 years of age, and 20.3% never stopped bottle-feeding. For children aged 3

years and older who stopped bottle-feeding, the rate was 16.2%, while for those aged 2–3 years, it was 31.3%. It is interesting to note that these children stopped bottle-feeding after the age of they reached 12 months, as children at this age are learning to walk and are still breastfeeding [18,19].

Half of the children's guardians, 58.8%, had never received oral health education. This population group indicated that guardians might not know how to practice oral and dental care for their children. Furthermore, 75.7% had never taken their children to see a dentist until the children experienced pain. This is similar to a study in Hong Kong, where they took children to the dentist only when they had dental problems. Therefore, oral health education programs must begin providing support and promotion as early as possible.

The high prevalence of dental caries (tooth decay) in children demonstrates an urgent need for primary prevention programs in Laos, as preventing decay before it starts is the best approach for such conditions. Preventing dental caries is not only the responsibility of dentists, parents, and pediatric departments, but also the duty of primary healthcare providers to supervise children during routine health visits before the onset of dental caries. This includes oral health examinations, dietary habits, and providing counseling on oral hygiene to guardians [20]."

The main risk factor for dental caries (tooth decay) in children is low family socioeconomic status. Dental caries in children is a public health issue that must be addressed collectively by all health professionals caring for children, along with efforts from family members to guide parents. Parents should take their children to see a dentist for oral health checkups and tooth examinations as early as possible, starting from the eruption of the first primary tooth. Dental professionals will assess all existing teeth and must advise parents on the best ways to prevent dental caries in children [21]. It is recommended that parents take their children for oral exams within the first two to three years (preventive dental visits starting from infancy) [22].

Conclusion

The study results showed that the prevalence of dental caries in preschool children was 93.3%, with a dmft (decayed, missing, and filled teeth) value of 7.1. This indicates the severity of dental caries in children. Within that figure, the value for missing teeth due to extraction was 0.05, and the value for filled teeth (restored teeth) was 0.32. The most affected teeth were the upper front teeth (incisors). The factor associated with dental caries in children is feeding the child with milk from baby bottles, sweetened milk, the frequency of consuming snacks and drinks, oral hygiene practices should be focused on, just as oral health education should be supported.

From this study, it has been shown that the prevention of tooth decay is not only the responsibility of dentists, parents, and pediatric departments, but it is also the responsibility of primary healthcare providers to care for children during routine health check-up visits before the onset of tooth decay.

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