A Cross-Sectional Study of Dental Caries and Quality of Life Among 36–71 Months Preschool Children: Vientiane, Lao PDR

Abstract

Introduction:Dental caries is a major problem in young children worldwide but particularly in developing countries such as Lao PDR

Aim: The Study describe early childhood caries occurrence and assessed their impact on the quality of life (QoL) in preschool children aged 36–71 months and their families in Vientiane, Lao PDR.

Methods: We conducted a cross-sectional study of 400 children aged 36–71 months from 18 randomly selected preschools in Vientiane Province, Lao PDR. Dental caries was assessed using the dmft andPUFA (pulp, ulcer, fistula, and abscess) indices using their standard criteria and protocols. The parent-reported Early Childhood Oral Health Impact Scale (ECOHIS) to assess the impact of dental caries on quality of life. Data were collected by one dentist trained during a Master in Dental Public Health program.

Results**:**Ninety-four percent of children had experienced dental caries (dmft>0),and 92% had untreated caries lesions (dt>0).The overall mean dmft was 8.7 teeth and increased from 7.1 at 36–47 months to 9.8 at 60–71 months. The mean decayed teeth and mean number of teeth with fistula increased with age (all $p<0.05$). The prevalence of dental infection (pufa>0) was 35%. Impacts on eating (69%), pain (58%), and parents' work (57%) were the most frequent. Caries experience and dental infection were directly correlated with impacts on QoL ($p<0.001$).

Conclusion: Preschool children in Vientiane have a very high occurrence of dental caries and infections and do not receive dental treatment, impacting the quality of their lives and their families.

Keywords: Dental caries, ECOHIS, PUFA,early childhood,Public Health,dental caries

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Introduction

Dental caries is a major public health problem in some Southeast Asian countries[1]. With economic development and globalization, communities that were previously isolated from Western lifestyles are adopting behaviors that increase their risk of non-communicable diseases, including dental caries.

Data on dental caries in the primary teeth of Lao preschool children is scarce.For example, a cross-sectional study by Sensombath et al. (2010)[2] of children aged 36–47 months in Vientiane, Laos' Capital city, reported 82% of children having dental caries, with a mean number of decayed, missing, and filled teeth (dmft) of 5.5. The prevalence was higher than those reported in Ho-Chi-Minh and Da Nang, Vietnam (74%)[3].Because existing dental services cannot address the demand associated with these levels of disease, most dental caries lesions remain untreated.

Severe untreated dental caries is common in preschool children in many countries[4], including young children in Lao PDR. Untreated caries cause pain and local and systemic infection,which may

require emergency care and hospitalization[5]. The severity of the disease directly affects the quality of life of children and their families as a consequence of their negative impact on eating, sleeping, and other personal and family living events,such as loss of school days, increased restriction in regular activities, and a diminished ability to learn [6]. Also, it has been shown that higher severity of untreated dental caries can interfere with normal growth and development [7,8].

Different tools have been used to assess the impact of oral health problems on individuals' quality of life [9]. These tools have revealed the negative impacts of oral diseases on children and their parents, including feeling guilty, being upset, and loss of workdays of caregivers who have to take care of their sick children[10] or secure payment for emergency dental treatment when they arise. Two tools are available for preschool children: the Early Childhood Oral Health Impact Scale (ECOHIS)[11] and the Scale of Oral Health Outcome for 5-year-old children (SOHO-5)[12].

Increasing levels of dental caries also challenge communities because they are required to respond to an increasing demand for dental services. This is particularly problematic for poorer countries such as the Lao PDR.

The objective of this study was to report the prevalence and severity of early childhood caries (ECC) and dental infections and evaluate their impact on the quality of life of preschool children and their families in Vientiane, Lao PDR.

Subjects and Methods

Study population and sampling

The study population comprised Lao children aged 36–71 months who attended preschools in Vientiane in 2014. Four out of nine districts representing Vientiane were randomly selected for participation. Preschools in each district were identified and ordered by size. Eighteen preschools out of 58were selected using probability proportional to size to include 400 children. Preschools with fewer than 60 children were excluded from the sampling frame. All students and their families in the selected preschools were invited to participate.

Normative Assessment

All children received an oral health examination by a trained dentist using a modified protocol and detection criteria from the World Health Organization's Oral Health Surveys Basic Methods [12]. The examiner (SS) was trained by an experienced epidemiologist (EDBA) during a Master's in Dental Public Health training program. Primary teeth were assessed for dental caries at the cavitation level. In addition, the protocol included an assessment of the PUFA (pulp, ulcer, fistula, and abscess) index. The PUFA index measures the extension of the dental caries process from the pulp to the soft tissues in the mouth and face, with a higher PUFA score representing a more severe presentation of the disease. This paper will refer to these clinical events as "dental caries sequelae" or "dental infections." Oral examinations were conducted with participants on a table in a supine position. The examiner used a headlamp, mirror, and dental probe. Data were entered into a WHO-modified data entry form and later transferred into a computer file for analysis.

Quality of Life: Self-Reported Impact on Daily Living

We used the ECOHIS instrument [10] to assess the impacts of dental disease on daily living. The ECOHIS consists of 13 questions divided into child impacts (part one) and family impacts (part two). The child impact section comprises four subscales: child symptom, child function, child psychology, and child self-image/social interaction. The family impact section contains two subscales:

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parent distress and family function. The questionnaire is scored using a five-point Likert scale with responses ranging from “never” to “very often” (equivalent to a score of 0 and 4, respectively). A total score ranging from zero to 52 is calculated as a simple sum of the responses, with higher scores denoting a greater oral health impact.

The original English version of the ECOHIS instrument was translated into Laotian. To test the methodology and item comprehension, a pilot study was conducted at the Pediatric Dentistry Department of the University of Health Sciences, Vientiane, with 20 children and their parents. Suggested changes were included in the final version of the questionnaire. These children were not included in the study.

Demographic information and ECOHIS data were collected for each child during a face-to-face interview with one of the child's parents or another adult responsible for bringing the child to school. Three trained assistant researchers conducted the interviews. All self-reported data were transferred into electronic files without identifiers.

Data management and Data analysis

All data were analyzed using SPSS (version 18). Bivariate analysis for categorical and continuous variables were tested for statistical associations at the alpha= 0.05 level using chi-square and student's t-test, respectively.

Results

The total sample comprised 387 children. Data from 13 children were missing due to a lack of cooperation during the examination (response rate=97%). The children ranged from 36 to 71 months, with a mean age of 53.2 (s.d.=9.9). Fifty-three percent of the participants were female.

Table 1 displays measures of disease prevalence. Around 94% of the participants had experienced dental caries, defined as having one or more decayed, missing, or filled teeth (dmft>0), and 92% had one or more decayed teeth (dt>0). Around 28% of participants had one or more missing teeth (mt>0), but none had filled teeth. Thirty-five percent of participants had one or more teeth with dental infections (pufa>0), 32% had fistulas, and 10% had abscesses.

The mean number of decayed and missing teeth was 8.73 (s.d.=4.75) (Table 1). The mean number of decayed teeth was 7.76 (s.d.=4.46), and the mean number of missing teeth was 0.98 (s.d.= 2.03). The mean number of decayed and missing teeth increased with age. On average, participants had 0.67 teeth with dental infections, with most of these sequelae being fistulas (0.52, s.d.=0.91).

Table 1. Prevalence of Early Child Dental Caries* Among Pre-school Children, by Age, Vientiane Capital, Lao PDR, 2014.

	36–47months (n= 124)	48–59months (n=139)	60–71months (n=124)	Overall (n=387)	P-value
Prevalence dmft>0**	88.7	96.4	96.0	93.8	P=0.017
Prevalence dt>0	87.1	93.5	94.4	91.7	P=0.073
Prevalence mt>0	22.6	31.7	29.0	27.9	P=0.247
Prevalence pufa>0***	20.6	38.8	44.4	35.4	P=0.001

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Prevalence f>0	15.3	37.4	42.7	32.0	P<0.001
Prevalence a>0	8.9	7.3	13.7	10.1	P=0.256
Mean dmft**	7.10 (4.99)	9.28 (4.47)	9.76 (4.41)	8.73 (4.75)	P<0.001
Mean dt	6.35 (4.52)	8.06 (4.27)	8.81 (4.28)	7.76 (4.46)	P<0.001
Mean mt	0.74 (1.86)	1.22 (2.29)	0.94 (1.88)	0.98 (2.03)	P=0.165
Mean pufa	0.40 (0.90)	0.76 (1.29)	0.84 (1.20)	0.67 (1.16)	P=0.003
Mean f	0.27 (0.72)	0.36 (1.01)	0.66 (0.90)	0.52 (0.91)	P=0.001
Mean a	0.13 (0.44)	0.12 (0.46)	0.18 (0.49)	0.14 (0.46)	P=0.413

*Measures by the decayed, missing, and filled index (dmft) and the pulp, ulcer, fistula, and abscess index (pufa).
** None of the participants have filling teeth.
*** There were no children with pulp infections or ulcers.

Table 2 shows the Early Child Oral Impact Scale (ECOHIS) result. For each item, the responder (mother, most of the time)marked how frequently the impact occurred in the child's lifetime. The most frequent impacts in descending order were eating (61%), pain (58%), work (57%), and drinking (52%). Other impacts were reported to have less than 50% occurrence, but all items were reported as impacting daily living. For example, the most infrequent impact, i.e., not talking, affected 30% of the children. Impacts that occurred often or very often included eating (10.4%), pain (9.3%), absence from school (8.8%), and sleeping (7.2%). All these impacts may be associated with pain and infection produced by dental caries. Around 40% of parents reported being upset or feeling guilty regarding the oral health problems of their children, and 40% reported that the oral health problems impacted family finances. Around 60% of parents reported the need to take time off from work to address the oral health needs of their children. The Mean ECOHIS score was 10.6 (s.d.= 9.3), and the mean scores for child and family impacts were 7.3 (s.d.= 6.7) and 3.3 (s.d.= 3.1), respectively (Table 2).

Table 2. Parent-Reported Frequency of Impacts on Daily Living of Children Aged 36–71 months using the Early Childhood Oral Health Impact Scale (ECOHIS). Vientiane Province, Laos, PDR, 2014.

Impact	ECOHIS* N (%)					Domain**
	Never	Hardly ever	Occasionally	Often	Very often	Mean (SD)
Child impact						**7.3 (6.7)**
1.Had pain in teeth, mouth or jaws	161 (41.6)	104 (26.9)	86 (22.2)	8 (2.1)	28 (7.2)	2.1 (1.2)
2.Had difficulty drinking	188 (48.6)	43 (11.1)	143 (37.0)	9 (2.3)	3(0.8)	3.6 (3.1)
3.Had difficulty eating some foods	152 (39.3)	48 (12.4)	147 (38.0)	18 (4.7)	22(5.7)	

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4.Had difficulty pronouncing	249 (64.3)	46(11.9)	81(20.9)	10(2.6)	1 (0.3)	
5.Missed preschool, daycare or school	237 (61.2)	41 (10.6)	75 (19.4)	17(4.4)	17(4.4)	
6.Had trouble sleeping	252 (65.1)	29 (7.5)	78(20.2)	12 (3.1)	16(4.1)	1.3 (1.9)
7.Had trouble or frustrated	252 (65.1)	37 (9.6)	84 (21.7)	11(2.8)	3(0.8)	
8.Avoided smiling or laughing	265 (68.5)	38 (9.8)	65 (16.8)	9 (2.3)	4(1.0)	1.2 (1.9)
9.Avoided talking	271 (70.0)	42 (10.9)	55 (14.2)	5 (1.3)	3 (0.8)	
Family impact						**3.3 (3.1)**
10.Been upset	233 (60.2)	40 (10.3)	95 (24.5)	11 (2.8)	7 (1.8)	1.4 (1.8)
11.Felt guilty	242 (62.5)	38(9.8)	95 (24.5)	3 (0.8)	1 (0.3)	
12.Took time off from work	169 (43.7)	52 (13.4)	147 (38.0)	7 (1.8)	10 (2.6)	1.8 (1.8)
13.Had a financial impact on the family	231 (59.7)	38(9.8)	104(26.9)	6(1.6)	8(2.1)	
Total Score						**10.6 (9.3)**

* Early Child Oral Impact Scale.

** 1=child symptom domain; 2,3,4,5=child function domain; 6,7=child psychological domain; 8,9=child self-image/social interaction domain; 10,11=parent distress domain; 12,13=family function domain.

We performed a correlation analysis between self-reported and normative data (Table 3). All correlation coefficients were statistically significant. The highest correlation was between ECOHIS children and pufa scores (Pearsons' r=0.400 p <0.001). The correlation between ECOHIS and decayed and missing teeth was 0.166, p = 0.001. The correlation coefficients were slightly larger for the children's ECOHIS scores than for the family scores across all normative measures.

Table 3. Correlation Coefficients Between Self-reported and Normative Measures of Dental Caries and Sequelae among Children aged 36–71 Months.Preschool children, Vientiane, Laos PDR, 2014.

	decayed teeth		decayed and missing teeth		pufa	
	r	p-value	*r*	p-value	*r*	p-value
ECOHIS children	0.173	P<0.001	0.175	P=0.001	0.400	P<0.001
ECOHIS family	0.133	P=0.009	0.119	P=0.019	0.284	P<0.001
ECOHIS total	0.170	P=0.001	0.166	P=0.001	0.385	P<0.001

Discussion

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Our study detected a high prevalence and severity of dental caries and sequelae and their impacts on daily living among preschool children in Vientiane, Laos PDR. Furthermore, the lack of filled teeth in any of the children, the large proportion of dental infections measured by pufa, and the burden on children and parents, as assessed by ECOHIS, suggest an emerging public health problem requiring immediate attention. Additional indicators of disease burden in this population included: 1) Over 90% of children were affected by dental caries (Table 1), 2) over one-third of children had dental infections (Table 1), 3) the average mean number of decayed and missing primary teeth was 8.73, and 4) over 20% of parents reported frequent impacts on daily living. Other findings also suggest that reporting caries prevalence and severity should be age-specific or include at least the age groups included.

There are few studies on the epidemiology of ECC in Laos. A 2008 study by Sensombath reported 82% prevalence and a mean dmft of 5.5 among children aged 36–47 months in Vientiane. This study included municipal public schools, municipal, private schools, and non-municipal schools[2]. The protocols and target populationsin Sensombath's and our study were similar. Therefore, the higher prevalence and severity among children aged 36–47 months in our study suggest increasing levels of disease separated by eight years. Both studies indicate that most children in Vientiane were affected by dental caries or its sequelae by the third year of life. This finding supports the need to monitor and provide earlier interventions for preventing and controlling ECC before the third year of life.

A study from HoChi Minh City and Da Nang, Vietnam, reported a 74% prevalence among preschool children, with 47% of parents reporting mouth pain[3]. A study of preschool children by Sutthavong in PhranakornSryudhya, a district of Bangkok, Thailand, reported similar disease levels as our study (95.4%, mean dmft=9.1)[13]. The National Oral Health Survey 2011 in Cambodia reported a slightly higher prevalence and severity of dental caries in primary teeth of six-year-old children: Over 90% had dental caries, with an averagedmft of 9.0[14]. Together, these studies indicate a high prevalence and severity of dental caries in primary teeth of preschool children or children entering school in Southeast Asian countries. In contrast, a study among Hong Kong preschool childrenreported a caries prevalence of 34.3% among children, with a mean dmft of 1.5±2.98. This study also reported that 5.2% of preschool children in Hong Kong had filled teeth, and 15% had Severe Early Childhood Caries (SECC). (The Hong Kong study used the 1999 NIDCR criteria classification of severe dental caries)[15]. A Wardha district, India study reported 33.5% of preschool children having Early Childhood Caries (ECC) [16]. This study reported a statistically significant association of ECC with a history of bottle-feeding ($p=0.0218$). In their literature review, Bagramian and coworkers suggested that increasing caries in developing countries is directly associated with changes in diets and lifestyles and migration from rural towards urban areas [17, 18]. Data from a national oral health study in Cambodia suggested that, in addition, changes in lifestyle and diet may be approaching the rural areas as well[14]. Notably, Kahn and coworkers reported in 47% of their participants in Vietnam, a high correlation between parents' and children's soda consumption ($p=0.361$; $p<0.001$)[3].

As reviewed by Duangthip and coworkers[1], studies from SEA reported in the literature in the last ten years show a wide range of dental caries prevalence (25–95%) and severity (dmft score = 0.9–9.0). Although these aggregate figures may be masking regional and demographic variations in normative estimates, these results point out the need for preventive interventions and access to dental care for preschool children in the entire SEA region, particularly in Lao PDR.

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Since the publication of the PUFA/pufa index [3], the protocol has been included in numerous studies and national surveys. Our study reported that one-third of children have dental infections and, on average, at least one tooth is affected. Similar results have been reported in local studies in preschool children in Bulang, Southwest China (prevalence=38%, mean pufa=1.2)[18] and Brazil (prevalence=23.7%,mean pufa=0.9)[19] but lower than the values reported in the Philippines (prevalence=85%, mean pufa=3.4) [3] and Cambodia (prevalence=64%, mean pufa=2.6)[14]. In the Philippines and Cambodia, "p" (pulp infection) was the main contributor to the total score. In our study, the main contributors to the total score were fistulas and abscesses, similar to findings in a Polish study[20]. These differences may result from different disease occurrence patterns and access to and utilization of dental care. Overall, these figures reflect neglected diseases that may have nefarious consequences on the growth and development of the child. Besides pain and suffering, children with dental infections have been reported as having below-normal BMI as compared to children without dental infections[20]. The proposed causal pathway is: 1) pain and discomfort result in reduced food intake, 2) reduced quality of life affects children's growth and development through restricted activity, reduced sleep, and concentration deficits, and 3) odontogenic infections may result in cytokine release which might impact on average growth.

An approach to assess the consequences of neglected diseases is through their impact on the quality of life. In this study, we used ECOHIS [10] because it was the only tool developed specifically for preschool children at the time of the study design. The levels of disease observed in our study were associated with a high impact level at the child and family levels. All participants reported at least one impact, and those more frequent were eating, pain, parent's work, and drinking. These are impacts associated with pain and infection and require taking time off from work to provide care for the affected children.Two of these impacts on eating and drinking may also be associated with limitations on good nutrition and difficulties in eating, drinking, and pronouncing words, as reported by Pahel [10]. The relationship between the ECOHIS scores (child impact, family impact, and the total scores) and the presence of dental disease was in the expected direction; the higher the ECOHIS score, the more severe the dental disease. Also, as expected, the normative indicator detecting more severe disease (pufa) had a higher correlation with ECOHIS than dmft.

Dental pain and infection in preschoolers is a public health problem and has an impact on society due to the high cost of curative treatment, absenteeism from school, parents/guardians' absenteeism from work, and the need for medication to control pain and infection. Toothache stemming from untreated dental caries also affects a child's activities of daily living, such as playing, sleeping, and eating [6].The systematic review and meta-analysiswith 14 studies reported that Children with ECC were more likely to report any impact on OHRQoL than children without caries (OR: 1.99; 95% CI: 1.51-2.62; 6 studies). Severe ECC (dmft> 5) presented a higher effect (OR: 5.00; 95% CI: 3.70-6.74; 8 studies) [21].The magnitude of those impacts was such that parents of children with dental and severe caries were 1.87 and 3.31 times more likely to report their children's quality of life being affected by their oral conditions than parents without those conditions[22].

Strengths and limitations

One limitation that needs to be addressed in epidemiological studies of preschool children is the difficulty in obtaining full cooperation from young children, especially those who previously experienced pain and discomfort. In our study, many children required additional behavioral modification, which lengthened the examination time. Implementing the parent-reported instruments

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was also difficult because parents or caregivers were only sometimes available, and further efforts and resources were needed to contact them. In addition, ECOHIS is designed to be reported by the parents alone, but, in some cases, the responders needed additional clarification, even though the questionnaire was pilot-tested after translation into the local language. We suggest using a facilitator during the completion of the questionnaire. Also, some caregivers may have provided inaccurate responses due to the lifetime span included in the questions. Unfortunately, we did not record the type of caregiver. Despite these limitations, the study showed robust statistical associations between self-reported and normative data with a high response rate.

Conclusions

In conclusion, our findings show a very high prevalence and severity of dental caries and its sequelae impacting the daily performance ofchildren and their families among children aged 36–71 months in preschools in Vientiane, Lao PDR. The results may be associated with changes in diet and lifestyle among children in Vientiane, and prompt intervention is required to prevent disease and provide appropriate dental care to address unmet needs. In addition, our study suggests combining normative and self-reported measures of oral health to have a more complete assessment of the oral health status and impacts of oral diseases at the individual and familial levels.

Consent

All parents were asked to sign an informed consent form before the examination date

Ethical Approval

The Medical Ethical Committee of the University of Health Sciences, Lao PDR, reviewed and approved the study protocol. To comply with ethical regulations, all official documents were completed before data collection. The letter describing the purpose of the study was submitted to school principals and Parent-Teacher Associations (PTAs)..

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