

Dental Caries and Oral health related quality of life among Vientiane Preschool Children, Lao PDR.

Abstract

We assess the impact of early childhood caries on the quality of life (QoL) in preschool children and their families in Vientiane, Lao PDR. We designed a cross-sectional study of 400 children aged 36-71 months from 18 randomly selected preschools in Vientiane. Dental caries was assessed using the dmft and PUFA (pulp, ulcer, fistula and abscess) indices. We used the parent-reported Early Childhood Oral Health Impact Scale (ECOHIS) to assess impact on QoL. Ninety-four percent had experienced dental caries (dmft>0) and 92% had untreated caries lesions (dt>0). The mean dmft was 8.7 teeth. 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 positively correlated with impacts on QoL ($p<0.001$). Preschool children in Vientiane had a very high occurrence of dental caries and infections and do not receive dental treatment, impacting the quality of their lives and their families.

Keyword: Dental caries, ECOHIS, PUFA

Introduction

Dental caries is a major public health problem in some Southeast Asian countries¹. 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, the Capital city of Laos, reported 82% of children have dental caries, with a mean number of decayed, missing and filled teeth (dmft) of 5.5. The prevalence is higher than those reported in Ho-Chi-Minh and Da Nang, Vietnam (74%)³. Because existing dental services are not capable of addressing this demand, most of this disease remain untreated.

Severe untreated dental caries is common in preschool children in many countries⁴, including young children in Lao PDR. Untreated caries causes pain, local and systemic infection which may require emergency care and hospitalization⁵. 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 aspects⁶. Loss of school days, increased days with restricted activity and a diminished ability to learn are common among children who had untreated dental caries⁷. Also, it has been shown that higher severity of untreated dental caries can interfere with normal growth and development⁸.

Different tools have been used to assess the impact of oral health problems on individuals' quality of life⁹. 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 children¹⁰, or secure payment for emergency dental treatment when they arise. Two tools

are currently 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.

Communities are also challenged by increasing levels of dental caries because they are required to respond to an increasing demand for dental services. This is particularly problematic for poorer countries such as Lao PDR.

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

Subjects and Methods

Ethical Considerations

The study protocol was reviewed and approved by the Medical Ethical Committee of the University of Health Sciences, Lao PDR. All official documents were completed before data collection in order to comply with ethical regulations. The letter describing the purpose of study was submitted to school principals and Parent Teacher Associations (PTAs). All parents were asked to sign an informed consent form before the examination date.

Study population and sampling

The study population comprised Lao children aged 36-71 months who attended preschools in Vientiane during the study period. Four of nine districts representing Vientiane were randomly selected for participation. Preschools in the four districts were identified, enumerated and 18 (out of 58) were selected using probability proportional to size to allocate a total of 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 Methods¹³. The examiner (SS) was trained by an experienced epidemiologist (EBDA) 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) index⁴. 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. In this paper, we will refer to these 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 instrument¹¹ to assess the impacts of dental disease on daily living. The ECOHIS consists of 13 questions divided into two sections: 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: 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. A pilot study was conducted at the Pediatric Dentistry Department of the University of Health Sciences, Vientiane, with 20 children and their parents to test the methodology and item comprehension. Suggested changes were included into 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 other adult responsible for bringing the child to the school. The interviews were conducted by three trained assistant researchers. 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 or incomplete due to a lack of cooperation during the examination (response rate=97%). The age of children ranged from 36-71 months, with the mean age of 53.2 (SD 9.9) months. Fifty-three percent were female.

Table 1 displays measures of disease prevalence. Around 94% of the participants had 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% had one or more missing teeth (mt>0). None of the participants had filled teeth. One-hundred and thirty-seven participants (35%) had one or more teeth with dental caries sequelae (pufa>0) and all of the affected children had fistulas or abscesses. Thirty-nine children (10%) had abscesses.

The mean number of decayed and missing teeth was 8.73 (sd. 4.75) (Table 1). The mean number of decayed teeth was 7.76 (sd 4.46) and mean number of missing teeth was 0.98 (sd 2.03). On average, participants had 0.67 teeth with dental caries sequelae, with most of these sequelae being fistulas (0.52, sd. 0.91).

Table 1. prevalence of Early Child Dental Caries among Pre-school Children, Vientiane Capital

| | 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 |
| 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 number of Early Child Dental Caries | | | | | |
|--|-------------|-------------|-------------|----------------|---------|
| 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 participants have filling teeth.

*** There were no children with pulp infections or ulcers

Table 2 shows the result of the Early Child Oral Impact Scale (ECOHIS). For each item the responder (mother, most of the time), marked how frequent the impact occurred in the lifetime of the child. The most frequent impacts in descending order were eating (61%), pain (58%), work (57%), and drinking (52%). Other impacts were reported with less than 50 percent occurrence, but all items were reported as impacting daily living. Indeed, 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 (sd 9.3) and the mean scores for child and family impacts were 7.3 (sd 6.7) and 3.3 (sd 3.1), respectively (Table 2).

Table 2. Parent-reported frequency of impacts on daily living of children aged 36-71 months. Vientiane Province, Laos, PDR, 2014.

| Impact | ECOHIS* N (%) | | | | | Domain** Mean (SD) |
|---------------------------------------|---------------|----------------|--------------|----------|------------|--------------------------|
| | Never | Hardly ever | Occasionally | Often | Very often | |
| 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) | 3.6 (3.1) |
| 2.Had difficulty drinking | 188 (48.6) | 43 (11.1) | 143 (37.0) | 9 (2.3) | 3(0.8) | |
| 3.Had difficulty eating some foods | 152 (39.3) | 48 (12.4) | 147 (38.0) | 18 (4.7) | 22(5.7) | |
| 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 carried out correlation analysis between self-reported and normative data (Table 3). The highest correlation was between ECOHIS children and pufa scores (Pearsons' $r=0.400$ $p < 0.001$) and lower, but statistically significant, between ECOHIS and dmft scores.

Table 3. Correlations 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 | |
|-----------------|---------------|---------|---------------------------|---------|----------|---------|
| | <i>r</i> | p-value | <i>r</i> | p-value | <i>r</i> | 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

Our study detected a very high prevalence and severity of dental caries, sequelae and 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 caries sequelae as measured by pufa, and the burden on children and parents as assessed by ECOHIS, suggest a public health problem requiring immediate attention. Additional indicators of disease burden in this population include: 1) Over 90% of children were affected by dental caries (Table 1); 2) over one-third of children were affected by dental caries sequelae (Table 1); 3) on average, 43% of children's teeth were affected by dental caries

(mean dmft of 8.73 over 20); and 4) parents over 20% of the total number reported frequency impacts on daily living (10.6 over 52).

There are few studies on dental caries in primary teeth 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 schools². Because the protocols used on both studies are similar, the higher mean dmft in our study could be interpreted as a true increase in disease occurrence or to differences in age, as our study included 36-72 months. Both studies point towards a high level of disease among preschool children in Vientiane, Laos PDR.

A study from Ho-Chi Minh City and Da Nang, Vietnam, reported a 74% prevalence among preschool children, with 47% of parents reporting mouth pain³. A study of preschool children by Sutthavong in Phranakorn Sryudhya, a district of Bangkok, Thailand, reported similar disease levels as our study (95.4%, mean dmft was 9.1)¹⁴. (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 9.0¹⁵. 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 children¹⁶ reported 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)¹⁷. A study from Wardha district, India, reported 33.5% preschool children having Early Childhood Caries (ECC)¹⁸. This study reported a statistically significant association of ECC with history of bottle-feeding ($p=0.0218$). In their review of the literature, Bagramian and coworkers suggested that increasing caries in developing countries is directly associated with changes in diets and lifestyles, as well as migration from rural towards urban areas¹⁹. 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 well¹⁵. It is noteworthy that Kahn and coworkers reported in 47% of their participants in Vietnam, a high correlation between parents' and children's consumption of soda ($p=0.361$; $p<0.001$)³.

As reviewed by Duangthip and coworkers¹, studies from SEA reported in the literature in the last 10 years show a wide range of dental caries prevalence (25–95%) and severity (dmft score = 0.9–9.0). On the average, the caries prevalence was 79% and the mean dmft is 5.1. Caries prevalence in preschool children in Brunei (59%, dmft=3.9)²⁰ and Singapore (49%, dmft=2.0)²¹ were lower than those of other countries in the region, while preschool children in the Philippines (97%)²², Lao PDR and Cambodia had very high caries prevalence (>85%). These values are in contrast with those from other countries, for example, China (66%)²³, the United States (23%)²⁴ and the United Kingdom (28%)²⁵. 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.

Since the publication of the PUFA/pufa index⁴, numerous studies have included its assessment in local and national surveys. Our study reported one-third of children having dental infections and, on average, at least one tooth affected. Similar results have been reported in local studies in preschool children in Bulang, Southwest China (prevalence=38%, mean pufa=1.2)²⁶ and Brazil (prevalence=23.7%, meanpufa=0.9)²⁷ but lower than the values reported in the Philippines (prevalence=85%, mean pufa=3.4)⁴ and Cambodia (prevalence=64%, mean pufa=2.6)¹⁵. In the

Philippines and Cambodia, "p" (pulp infection) was the main contributor of the total score. In our study, the main contributor to the total score were fistulas and abscesses, similar to findings in a Polish study²⁸. These differences may be a result of different patterns of disease occurrence, and access to, and utilization of, dental care. Overall, these figures reflect neglected disease 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 infection²⁹. 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, concentration deficits, etc; and 3) odontogenic infections may result in cytokine release which might impact on normal growth.

An approach to assess the consequences of neglected disease is through their impact on the quality of life. In this study, we used ECOHIS because at the time of study design, it was the only available tool developed specifically for preschool children¹¹. The levels of disease observed in our study were associated with a high level of impacts 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, difficulties in eating, drinking and pronouncing words, as reported by Pahel.¹¹ 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 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 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 eating⁷. The magnitude of those impacts was such that parents of children with dental caries and severe caries were, respectively, 1.87 and 3.31 times more likely to report their children's quality of life being affected by their oral conditions than parents of children without those conditions³¹.

Strengths and limitations

One limitation not frequently addressed in epidemiological studies of preschool children is the difficulty in obtaining full cooperation from young children, especially those who previously had experienced pain and discomfort. In our study, many of these children required additional behavioral modification, which lengthened the time of the examination. Implementation of the parent-reported instruments was also difficult because parents or caregivers were not always available and additional 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 very high response rate.

Conclusions

In conclusion, our findings show that a very high prevalence and severity of dental caries and its sequelae have direct impacts on daily performance on children and their families among children aged 36-71 months in kindergartens in Vientiane, Lao PDR. The results may be associated with changes in diet and lifestyle among children in Vientiane, and require prompt intervention to prevent disease and provide appropriate dental care to address unmet needs. In addition, our study suggests the contribution of 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.

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