

ABSTRACT

Background: A decreasing trend in prevalence and severity, with polarization of dental caries is witnessed over the last three decades in many countries. Consequently, the current convention for management of caries is through risk assessment. According to Sri Lankan data around 10% of children are having permanent tooth caries within 2-3 years of permanent tooth eruption. This 10% of students can be categorized as having a higher risk for caries. School Dental Services in Sri Lanka catering for this age group, is currently grappling with an array of problems, yet on the verge of upgrading. A specific mechanism for identifying and managing ‘high risk’ students for caries is still not in place in School Dental Services in Sri Lanka, which could be considered a major service provision gap. Identifying ‘high risk’ students at the crucial age of 5 years (at grade 1), just before eruption of permanent teeth is needed to effectively implement preventive strategies.

Objective: To develop and validate a caries risk prediction model for 5-year-old school children in the Western Province, Sri Lanka.

Methods: The study consisted of 2 phases. Phase 1 was on getting preliminary data for model development. A cross-sectional study was done to determine the prevalence, severity and associated factors of caries in 5-year-old students. Probability proportionate to size sampling technique was used to select schools from the Western Province and 353 students participated in the study. Five year olds were categorized as ‘high’ and ‘low’ risk depending on severity of caries on posterior deciduous teeth, for determining associations. Clinical examination and pretested questionnaires for students and parents were used as study instruments to collect clinical, socioeconomic and oral health habit related data. Chi-squared test was used to test statistical significance. Additionally, selecting School Dental Therapists with satisfactory dental records was done, as secondary data was used as one source of data in model development and validation.

Phase 2 consisted of two case-control studies for model development and validation. Based on satisfactory dental records, 120 cases and 360 controls for model development, and 100 cases and 100 controls for model validation were recruited after confirmation of case-control status by clinical examination. Cases and controls were defined as grade 4 students with and without permanent tooth caries respectively. All available consecutive

cases were selected according to the class registers. Non-cases, whose names are appearing just after the names of cases were selected as controls.

Data on clinical variables, socioeconomic factors and oral health related habits, which were present when the participants were in grade 1 was collected using secondary data from dental records and a pretested parental self-administered questionnaire. Risk predictors were identified and a risk score was computed by multiple logistic regression analysis. Criterion validity was assessed by application of the model to an external sample. For categorizing risk as high and low, a cut-off point was determined by plotting a ROC curve. Judgement validity was assessed by expert opinion.

Results: Phase 1- Prevalence of dental caries was 56.7% (95% CI: 51.5% - 61.9%) and 3.4 % (95% CI: 2.4% - 4.3%) for deciduous and permanent dentitions respectively. Severity was a mean dmft of 3.01 (95% CI: 2.61-3.41), SiC index of 7.62 (95% CI of 7.34-7.9), pufa of 32.77% (95% CI of 32.32%-33.22%) and a mean pufa score of 1.26 (95% CI of 1.13-1.39) for deciduous dentition. For the permanent dentition mean DMFT was 0.05 (95% CI: 0.02-0.08) and SiC index was 0.14 (95% CI of 0.1-0.18). Factors associated ($P \leq 0.05$) with caries were ‘snacking in between meals’, ‘father’s educational status’, ‘number of missing teeth of father’ and ‘visible plaque index’.

Phase 2- Four risk predictors were identified on performance of backward logistic regression analysis. They were: ‘having 5 or more posterior decayed teeth’ (OR= 2.1, 95% CI: 1.0 - 4.4), ‘brushing frequency of once or less’ (OR= 3.5, 95% CI: 2.1 - 6.0), ‘not using fluoridated toothpaste’ (OR= 3.2, 95% CI: 1.8 - 5.6) and ‘consuming more than two snacks containing fermentable carbohydrates in between meals’ (OR= 1.6, 95% CI: 0.9 - 2.9). A 10 point score was developed by 0.5 rounding of adjusted odds ratios. Thus, the risk scores obtained were as follows: ‘having 5 or more posterior decayed teeth’= 2, ‘brushing frequency of once or less’= 3.5, ‘not using fluoridated toothpaste’= 3, ‘consuming more than two snacks containing fermentable carbohydrates in between meals’= 1.5. Following external validation, a sensitivity of 31% (95% CI: 22.1% - 41.0 %) and a specificity of 87% (95% CI: 78.8% - 92.9 %) was obtained for a cut-off value of 2.5.

Conclusions and recommendations: Despite been exclusively based on School Dental Services, the developed model could be used by oral health service providers for identifying high caries risk students. The model could be applied especially in areas with high disease burden and low service accessibility to improve the service coverage. The sensitivity of the developed model could have been further improved by incorporating caries indicators of polarization such as Significant Caries Index (SiCI) and pufa index. Further studies are warranted in this regard. Capacity building and improvements on protocols for management of high caries risk students are needed to address polarization of the disease.

Key words: *Dental caries, risk prediction, model development, model validation*