Dental Caries Risk Assessment Among 6-10 Year Old School Going Children - A Pilot Study

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Abstract

The aim of this study was to assess the dental caries risk among 6-10 year old school children in Chennai city using an assessment tool given by American Dental Association (ADA).

Methods

This cross-sectional pilot study was conducted among 152 school going children of age 6-10 years, who had their siblings studying in the same school. It was carried out using the Caries risk assessment form for age over 6 years, given by ADA in 2009. Phase I data was obtained by personal or telephonic interview from parents and phase II data from clinical examination of each individual with an average of 30 children per day.

Results

Ninety eight males (64.5%) and fifty four females (35.5%) with a mean age was 8.0 ±1.4 years were included in the study. Among the 152 children, 2.0 % (n=3) belonged to low, 40.8 % (n=62) to moderate and 57.2 % (n=87) were in high risk category. Fisher’s exact test showed significant association between sugar intake, caries experience and teeth missing due to caries with that of the risk assessed. Cronbach’s alpha reliability for the questionnaire was found to be 0.587.

Conclusion

A total of 18 factors were assessed, of which only three were found to contribute for determining risk among the sample studied. Since the risk assessment form was designed for a different population, modifications are recommended for its validation in the Indian scenario.

Keywords

Caries Risk Assessment; School Children; Siblings; ADA Tool

Introduction

Dental caries continues to be a universally present, multifactorial condition which does not undergo termination and demands expertise and time consuming professional treatment [1, 2]. Although there has been a significant change in the caries prevalence among certain groups of population in the past decade, with the advent use of fluoride in preventive therapy, untreated dental decay, still affects 60% - 90% of children throughout the world [1, 3].

Literature shows that, the pattern of caries distribution has changed over the years with only a small group of people representing the high risk minority like children or adults who have high daily average intake of sugars, people with less manual dexterity and thus have difficulty in maintaining proper oral hygiene compared...
to the major low caries counterpart [1, 2]. This skewed distribution of high risk minority is mostly seen in children, and has led to the development of individual based high risk approach for efficient management [4, 5, 6]. Risk factor assessment plays a major role in inhibition of these factors which help in future prediction models. In case of dental caries, risk assessment refers to the determination of the possibility of disease incidents, as the number of new non-cavitated or cavitated lesions developing over a given period of time [1, 4, 5, 6].

India is ranked in 2004 by the World Health Organization as one among the high risk regions for caries development, especially in the South and South East Asian region with an average DMFT of 2.90 - 7.81 among 12-year-old children, when compared to other regions of the world [6, 7]. With this massive proportion of disease individualized care to all the affected children becomes a tedious task.

Recent studies have thrown light on factors like socioeconomic status, culture, environmental and behavioral differences to be some of the major influencers of the oral disease burden among the Indian population [8, 9, 10]. These factors form the socio-demographic determinants group, which play a critical role differentiating the risk among Indian population from the western population [9, 10, 11, 12].

Over years, various assessment tools have been developed across the world for the purpose determining caries risk [3, 12, 13]. Among these, predominantly used tools include Cariogram in 1997, guidelines by AAPD (American Academy of Paediatric Dentistry) in 2002, assessment tool by American Dental Association (ADA) in 2009 and Caries Management and Risk Assessment (CAMBRA) in 2011. These tools commonly assess the risk based on three major categories namely diet and sugar intake, medical history of the individual and clinical findings [14, 15, 16]. However the number of factors and additive diagnostic aids required for each differs. The most widely used risk assessment model is the Cariogram. However, its cost effectiveness and application on large scale population is questionable [14, 15].

The assessment tool given by ADA is a simpler approach and also provides a complete understanding of the contributory factors, determines the individual/patient specific progression of caries development and also helps the clinician to follow the necessary preventive procedures appropriate for each individual patient [16, 17]. The advantage of this tool is that it is more convenient and does not involve the use of any additional diagnostic tool like radiograph or salivary count, making it an effective tool, which can be used under a field setting. Further this tool can be effectively used for initial risk assessment making it a cost effective caries risk assessment tool among an Indian population. However till date, literature on dental caries risk assessment using this tool is sparse [15]. Hence this study was aimed to assess the dental caries risk with, the assessment tool given by ADA among 6 – 10 year old school going children in Chennai city.

Materials and Methods

This cross sectional study was designed to assess the dental caries risk among 6-10 years old school going children in Chennai city. Ethical clearance to conduct the study was obtained from the Institutional Review Board of Ragas Dental College and Hospital, Chennai, and permission to conduct the study was obtained from the school authorities. Since gender and socioeconomic variables were considered as confounders for the study, only self funded schools which provided education for both the genders were considered.

For the present study sample size was estimated to be 152 from the dental caries prevalence data of 60% to 90% among 12 year old children, as estimated by the FDI, World dental federation in 2015 [7]. For the present study, of the 15 schools approached only 2 of them gave permission to conduct the study. All the students between grades 1st to 5th were assessed for this study. Only those children whose parents gave an informed consent, were willing to answer the questions related to caries risk and those who had siblings studying in same school were included in the study. Among the 2,072 children who were screened, 560 fulfilled the inclusion criteria. The children with systemic illness and those who were absent on the day of the study were excluded from the study and a total of 152 students participated in the study.

Caries risk assessment was done using the caries risk assessment form for over 6 years given by the American Dental Association [16]. The data were collected from the study subjects in two phases. Phase 1 involved the assessment of demographic characteristics, factors contributing to caries risk and systemic health of the study subjects. This information was obtained by personal interview of the study subjects and their parents and also using their school records. Second phase consisted of clinical examination which was conducted at the school premises on the same day. Around 30 children...
were assessed on a single day and the study was completed in a time span of two months from October to November 2016.

The data obtained from interview and clinical examinations were compiled systematically in Microsoft Excel 2013 and analyzed using SPSS (Version 20, SPSS Inc., Chicago, USA) software. Descriptive statistics were obtained for all demographic study variables. Frequencies and distributions were obtained for each factor and chi-square test was used to compare the frequencies. A p value of ≤0.05 with 95% confidence interval was set to indicate statistically significant differences among the various factors.

Results

A total of 152 children with mean age of 8.0 ±1.4 years, consisting of 64.5% (n=98) males and 35.5% (n=54) females were included in the study. The outcome variables were assessed based on the dental caries risk category to which each subject belonged to, which was in turn determined by the factors assessed. The subjects were categorized into three risk groups as low, moderate and high based on the criteria given by the ADA dental caries risk assessment form.

Table I and II show the frequencies of occurrence of dental caries risk among male and female participants based on the presence or absence of a risk factor. It was estimated that, 2.0% (n=3) of the children belonged to low risk category with 40.8% (n=62) in moderate and 57.2% (n=87) in the high risk category. All the children examined were found to be apparently healthy with no relevant history of medications, eating disorder or drug abuse. Fisher’s exact test showed significant association of sugar intake, dental home, carious lesions present, and tooth missing due to caries with that of the risk according to the ADA specification [Table I and II]. The overall reliability of the assessment form was found to be 0.587.

Discussion

The assessment form used in this study was developed by the Councils on Dental Practice (CDP) and Scientific Affairs (CSA), along with cariology subject matter experts, and with input from the Council on Access, Prevention and Interprofessional Relations (CAPIR). This was first published in 2009 and last revised in September 2016 by the American Dental Association (ADA) [16].

It consists of a total of 18 questions divided into 3 groups namely contributing, general health and clinical conditions with 4, 5 and 9 questions respectively in each category. Based on the risk assessment, the individual can be categorised as low, moderate or high risk and further the follow-up instructions can be given based on the same criteria.

A total of 57.2% children belonged to high risk category, 40.8% belonged to the moderate category and the remaining 2% to the low risk category which is different.
from the existing reports of caries risk among school going children by Madhumitha M et al, Gauba K et al in 2016 and Hebbal M et al in 2012 [3, 4, 17]. The reason for this variation may be attributed to difference in age of study participants, which is the mixed dentition group in our present study compared to the index group of 12 years in the other studies, wherein almost all permanent teeth would have erupted.

Existing literature shows that Cariogram has been satisfactorily validated for almost all age groups except in pre-school children. Also, its graphical representation enhances the patient’s understanding of his/her oral health status. Despite the above mentioned merits, Cariogram has still proved a difficult tool for risk assessment. Twetman S and Fontana S [19, 20] have also stated that the disadvantage with the Cariogram was that the program was complex and requires costly and time consuming laboratory tests.

CAMBRA has been considered as a good tool for clinical practice and it mainly assesses the presence of caries balance between risk factors. The main drawbacks of this as suggested by Braga MM, Ekstrand KR et al. [21] was that it considered white spot lesions under thick biofilm as an important risk factor and assessment of the biofilm varied between each clinician.

To date, literature shows very minimal evidence on caries risk assessment using the above tools, and none of the studies have shown to use the caries risk assessment form given by the ADA [15, 20].

A systematic review on determining dental caries in children by Harris R et al [22] in 2004 suggested food cariogenicity combined with the frequency of consumption of sugar was as a significant risk indicator. Other contributing factors determined by this study were plaque levels (amount, type), low fluoride intake, family constitution and income, Streptococcus mutans count along with frequency of brushing.

Twetman et al. [19, 20] showed evidence to confirm that past/active caries and dietary sugar intake were good predictors of future caries activity among all age groups [13, 15, 19, 20]. Tagliaferro EP [23] and co-workers in 2008 stated caries experience in primary

**Table II:** Frequencies of Occurance of the Clinical Factors Among Both the Genders in Low, Moderate and High Risk Groups

<table>
<thead>
<tr>
<th></th>
<th>LOW RISK (n=3, 2.0%)</th>
<th>MODERATE RISK (n=62, 40.8%)</th>
<th>HIGH RISK (n=87, 57.2%)</th>
<th>Corrected Item-Total Correlation</th>
<th>Cronbach's Alpha if Item Deleted</th>
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<tr>
<td>M  F  %</td>
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<td>9 7 8.9</td>
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<td>12 7 77.3</td>
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*Fisher’s test showed a significant association of 0.000, 0.011 between carious lesions, teeth missing due to caries respectively with that of risk assessed
dentition, fluoride history and sugar consumption and diet habits were important risk factors of dental caries in school children.

This cross-sectional study showed that there was a variable risk of dental caries in children of age 6 to 10 years. Of the factors given, only 3 of them were found to be significant in determining the risk which includes, sugar intake, caries experience and teeth missing due to caries.

The major limitation of this study was that this risk assessment form as such has been designed for a different population under a different scenario and hence direct use of this form for the Indian population may raise question regarding the validity of this form. This pre-validated assessment form designed for the American population has been used as such in the present study without any translations. The contributing conditions and general health conditions were answered by the mother of the participant. Even though all the parents had a formal high school level education, questions regarding the comprehend ability of certain contributing factors like fluoride exposure and dental home concepts need to be addressed as the present population were not able to understand the exact meaning of the terms fluoride exposure and dental home.

**Conclusion**

Among the 18 factors assessed based on the ADA dental caries risk assessment form, three were found to be statistically significant, in predicting dental caries risk among 6 to 10 years old school going children in Chennai city. Hence, modification of variables like fluoride exposure and dental home has to be done based on further epidemiological studies to improve the applicability of this assessment tool for dental caries risk assessment among the Indian population.

**Reference**


