RECENT ADVANCES IN CARIES RISK ASSESSMENT TOOLS IN PEDIATRIC DENTISTRY

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ABSTRACT

AIM: The aim of this literature study is to discuss about various caries risk assessment tools used in pediatric dentistry.
OBJECTIVE: The main objective is to discuss how dental practitioners can assess the risk of caries prevalence among pediatric patients in their practise.
BACKGROUND: Caries diagnosis is one of the most basic diagnostic skills that oral healthcare professionals must learn and yet, it remains one of the most difficult skills to reliably and predictably master. Caries risk assessment determines the probability of caries incidence in a certain period.
REASON: To educate health care providers about assessment of caries risk in contemporary dentistry and aid in clinical decision making regarding diagnostic, fluoride, dietary, and restorative protocols.

*Keywords***: Caries risk, cariogram, assessment, biofilm, sugar**

INTRODUCTION:

Dental caries is that the most typical oral disease seen in dentistry despite advancements in science, and continues to be a worldwide health concern (1). The recent increase within the prevalence of cavity among kids has highlighted the necessity for a replacement approach to assess risk of caries for paediatric patients at a younger age. The utilization of fluoride publicly water provides, dentifrices and skilled products, improvement of oral hygiene practices yet as accrued access to aid have contend a serious role in dramatic improvement (2). However, caries still remains one amongst the foremost prevailing chronic diseases.

Several factors play necessary role within the development of cavity and it's important to understand however these factors have an effect on the disease process. The cavity risk tells us the patients` risk of developing new cavity lesions or progression of existing lesions at the time of the assessment. Caries is conjointly one of the most common non communicable diseases worldwide, following cardiac diseases, diabetes, cancer, and chronic preventative pneumonia.(3,4) Cavity risk for the paediatric population is very regarding as a result of, many times, these patients want additional aid, restorations, or have multiple missing teeth, or oral hygiene compliance problems. Recurrent cavity around existing dental restorations may result in their premature failure and accrued health care prices.

Risk assessment procedures employed in practice unremarkably have adequate knowledge to accurately quantitate a person's disease process and permit for preventive measures (5). Even supposing caries-risk knowledge in dentistry still don't seem to be adequate to quantitate the models, the method of crucial risk ought to be a part within the clinical decision-making process (6). There are different ways in which we can inform the patient of how important the various factors are and how to reduce the caries risk Example of such tools area unit the Cariogram, developed in Scandinavian nation, and CAMBRA (Caries Management by Risk Assessment) developed in USA and numerous different tools.These systems will stimulate each dentists and patients to apply existing information.

Assessing all the chance factors helps to search out the etiology of the unwellness and offers a additional accurate analysis of the chance of developing cavity in an exceedingly specific patient. This helps us to convey the patient the simplest possible treatment. Most dentists nowadays assess the cavity risk in every patient automatically, however it is not bound however and if dentists consistently use this information in their treatment selections.This article discusses how general practitioners privately follow will incorporate caries risk assessment into the great management of caries in their patients.

MATERIALS AND METHODS:

We have done a study of the literature from the last 15 years. Articles were found with the search words "Caries risk assessment ", "Cariogram", " cariometer app" , " lactic acid impression" , " traffic light matrix" , risk assessment tools" and "CAMBRA - Caries Management by Risk Assessment" in Google Scholar. We got a result of 347 articles, many of which were not relevant. With limitations to the last 15 years and only studies on people less than 18 years of age, the result was 246 articles, and from these we have tried to find the most relevant papers. The articles were evaluated by the title or by abstract. We have also used the cariology book "Dental caries – the disease and its clinical management " for reference.

RISK INDICATORS:

There are both pathologic and protective factors involved in the caries disease. Some of these have a larger impact on the disease development than others. It is not possible to evaluate the risk from looking at just one risk fa ctor, you have to evaluate all the factors together.

SALIVA: No variation in a very single salivary component in a very healthy population has been shown to be a big Reduced issue. however shrunken secretion perform, as manifested by extreme dry mouth, could be a consistent predictor of high cavity risk (7). Despite the very fact that standard salivary flow is a particularly vital intrinsic host issue providing protection against tooth decay, there's very little info concerning the prevalence of low salivary flow in children(8) . It's necessary that secretion tests are taken in a very standardised approach so as to be able to assess tests taken at totally different occasions . Secretion is usually collected at the start of the treatment session . The patient shouldn't eat, smoke or brush his/her teeth one or 2 hours before taking the test.

Figure 1 : Factors for caries development

SUGAR CONSUMPTION: The amount of sugar consumption also additionally frequency of sugar intake contributes to cavity. The connection between sugar consumption and tooth decay in developed countries has long been viewed as an absolutely linear one – the more the consumption and also the higher the frequency the larger the caries severity (9). However, consumption of drinks with high sugar content similar to soda or powdery beverage concentrates made with sugar was related to progression of cavity (10,11) . Recently, WHO guideline on sugar intake for adults and kids terminated that even a little reduction in risk of cavity thanks to less consumption of sugar in childhood is of significance in later life (12). Diet similar to carbohydrates, starch conjointly plays a significant role within the tooth decay development. The stickiness of starch enhances the retention time of carbohydrates, leading to a chronic pH fall. The cariogenic result are going to be amplified in a diet consisting of high amounts of each mono and disaccharides along with starch. However, starches alone are less cariogenic than sucrose, glucose and Fructose. Sucrose is the most cariogenic sugar as a result of it offers the microorganisms, such as MS, the risk to turn out extracellular polysaccarids (13). After we measure the diet we have to look at the frequency, amount and consistence of the food intake. The frequency of meals is the most necessary dietary issue (14). Once the frequency is high the enamel will not have the time to remineralize between the intakes. Liquids are cleared quickly, whereas adhesive (sticky) foods vary in retentiveness. Sweet biscuits and potato chips for example, have high retention rates.

ORAL HYGIENE HABITS: The accessible evidence doesn't demonstrate a clear and consistent relationship between oral hygiene and cavity prevalence (15). The reported association with tooth brushing frequency is additional doubtless because of use of fluoridated toothpaste(16). The oral hygiene of a patient will be measured by colouring the plaque. One straightforward and effective way to management the progression of tooth decay at the individual level is to enhance the oral hygiene therefore suppressing the presence of the dental biofilm. This could be worn out combination with regular use of fluoride, desirable within the style of a fluoride dentifrice.

BACTERIA: Streptococcus Mutans and Lactobacilli, the most microorganism that are concerned within the tooth decay method, are constituents of the traditional flora.
So tooth decay is taken into account as a microorganism ecologic imbalance instead of as an exogenous infection (17). At a population (group) level, total microorganism count has been weakly related to tooth decay experience (18) . At the individual level, microorganism count could be a poor predictor of future tooth decay (19). Mutans Streptococci levels and also the age of colonization with cariogenic flora are valuable in assessing tooth decay risk, notably in very young children (20). Cariogenic

microorganism turn out acid from possible carbohydrates within the diet. They conjointly turn out extracellular and living thing polysaccharides. The extracellular polysaccharides contribute to the biofilm matrix and enhances microorganism adhesion to the tooth surface and microorganism. The living thing polysaccharides will be used for energy production and regenerate to acid once sugar isn't available within the mouth. it's necessary to stay in mind that presence of cariogenic microorganism doesn't essentially mean that you simply have tooth decay. tooth decay typically develops within the interproximal areas and in fissures, therefore one ought to be further thorough once cleansing these areas . Plaque is that the main etiological factors for the event of tooth decay. the number of cariogenic microorganism depends on the diet, oral hygiene and also the secretion.

CARIES RISK ASSESSMENT:

Caries Risk Assessment Tool (CAT):

This tool was developed by the American Academy of Paediatric Dentistry (AAPD)[21]. Depending on the age of children CAT incorporates three factors in assessing caries risk, namely, biological as well as protective factors and clinical findings. The AAPD CAT consists of various one-page assessment forms (based on patient age) which characterise risk in terms of biologic/behavioural factors, protective factors and clinical findings. The tool includes recommendations for treatment planning based on patient risk. Factors evaluated include: socioeconomic status, diet (sugar and beverage consumption), special health care needs, recent immigrant, fluoride use, oral hygiene, dental home, inter-proximal lesions, active white spot lesions or enamel defects, salivary flow, restorations, wearing an intraoral appliance. There are separate forms for age 0-5 years and age > 6 years. There are separate tools for dental professionals and for non-dentists.

Figure 2 : Caries risk indicators

Caries Management by Risk Assessment (CAMBRA):

The CAMBRA model was published in 2003 by a bunch of experts from the United States. Dental caries management by risk assessment (CAMBRA) is an evidence-based approach to preventing or treating the reason for tooth decay at the earliest stages instead of expecting irreversible injury to the teeth. This philosophy needs an understanding that tooth decay is an infectious microorganism biofilm disease that's expressed in a very predominantly pathologic oral surroundings.(22)This has been designed to use with newborns to youngsters supported their age(23). CAMBRA is basically based on identical factors as CAT to assess dental caries risk.According to proof, by additionally CAMBRA, initial dental caries might be reversed and disease manifestations could also be prevented. CAMBRA conjointly focuses on borderline operative intervention of cavitate lesions and defective restorations. There are a range of dental caries risk assessment forms available from professional associations and industry publications to help clinicians in decisive a patient's risk. The american Dental Association developed 2 forms that confirm low, moderate or high risk: one for patients 0-6 years old, and one for patients older than six years. These may be downloaded at no cost from the ada web site. The americanAcademy of pediatric dentistry has developed 2 forms that confirm low, moderate or high risk: one for kids 0-5 years old, and one for kids older than 5 years. These forms may bedownloaded from the AAPD web site. 2 CRA forms are published within the Journal of the california, Dental Association and determine low, moderate, high and extreme risk: one for patients aged 0-5 years, and one for patients age six through adulthood. These forms may be downloaded from the CDA Foundation web site.

Figure 3: Caries Risk Assessment Form (0-6 years)

Cariogram:

Prof. D. Bratthall developed this concept and the formula for the Cariogram in Malmö.The PC version was created in coll aboration with Dr. L. Allander and K– O. Lybegård

B.Sc., and the manual was written by D. Bratthall, G. Hänsel Petersson and J.R: Stjernswärd. Cariogram is a software program which aims to demonstrate the multi-factorial background of dental caries. This graphically illustrates as a pie-circle diagram a patient's risk of developing new caries while simultaneously expressing the contribution of different factors on the caries risk for that particular patient [24]. The Cariogram is divided into coloured sectors. There are five different sectors in the pie circle diagram. These are the green sector (actual chance to avoid new cavity), the dark blue sector (diet), the red sector (bacteria),the light blue sector (susceptibility) and the yellow sector (circumstances). For all patients the factor "0" is the best value and "3" (or "2" where that is maximum) is the most unfavourable score. It is possible to enter ten scores in this program, but the Cariogram appears already when only seven of the scores have been entered. Any unfilled box will make the program less specific. These factors are assigned a score based on a stipulated scale and entered into an interactive PC-program, which produces a pie-diagram.
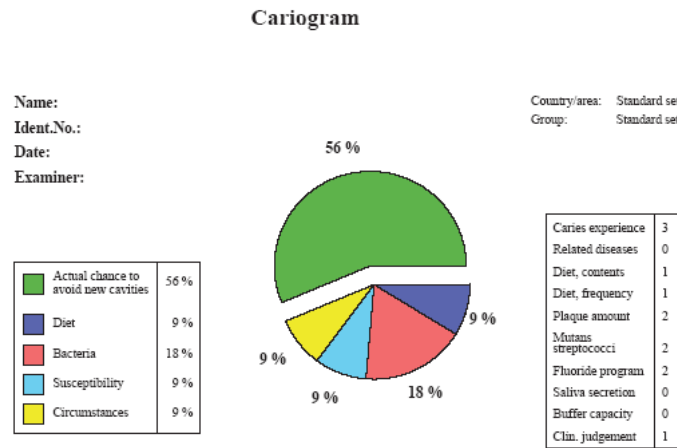

Figure 4: Cariogram assessment chart

Cariometer app:

Calorimeter app is developed from a evidence based research and provides an estimate of cariogenic risk of dentition based on daily diet and other oral hygiene practises. Patient should register their details in this app. This app aims in the prevention of dental caries at an early age beginning from primary dentition itself. It also provides daily cariogenic risk status which can be shared with healthcare professionals.
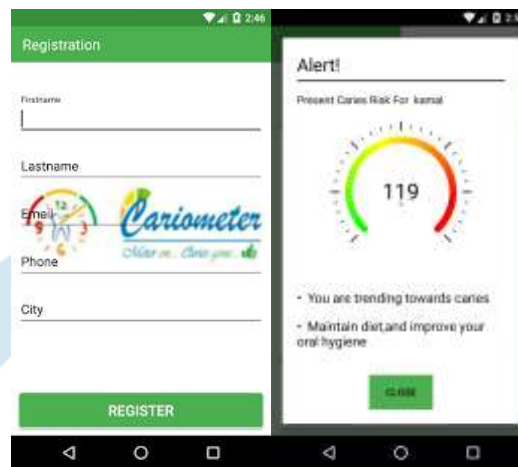

Figure 5: Cariometer app

Traffic Light Matrix (TLM):

This is a commonly used CRA tool in Australia [25]. It is based on various criteria in 5 different categories such as saliva which includes hydration, viscosity pH, Quantity/rate,and buffering capacity , then plaque including pH, maturity and bacteria – Mutans count , then diet like sugar and acid exposures in between meals or aday then fluoride exposure like exposure to fluoride via water/toothpaste/professional and other modifying factors like drugs that reduce salivary flow, diseases resulting in dry mouth, fixed/removable appliances etc
where traffic light colours convey varying risk levels ,red=high, yellow=moderate and green=low.

Figure 6: Traffic light matrix assessment chart

Lactic acid impression:

Lactic acid impression method is done by using clinpro 3M ESPE which can detect lactic acid. The lactic acid has a main role in fermentation of caries. This impression material consists of a powder and an activator to induce setting. It also contains a sugar solution which is metabolised during the 3 minutes of setting. Thus fermentation of sugar and production of lactic acid takes place immediately and there is colour change of the impression material to indicate reaction with lactic acid. Another type of clinpro is Clinpro Cario L-Pop (CCLP) which is used to monitor the individual caries risk. This test translates the capacity of the tongue microflora to produce lactic acid which is scored of 1-9, indicating a low, medium or high risk for caries development. In this technique tongue swab is taken introduced in lactic acid solution and the colour change indicates the level of risk.
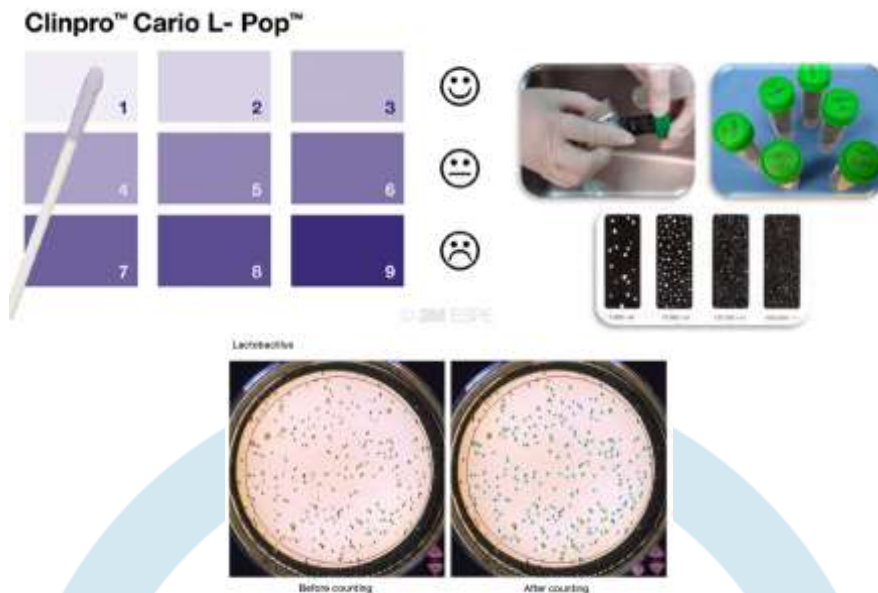
Figure 7: Lactic acid impression - culture method

CONCLUSION:

Dental caries is a burden on patients, clinicians, and hospitals. Dental caries is a complex disease that requires aggressive preventive treatment. Because caries is a multifactorial disease, the incorporation of caries risk assessment into the concept of caries management should include factors that may affect caries development. Factors such as past and current caries, diet, and fluoride exposure, presence of cariogenic bacteria, salivary status, general medical history and sociodemographic influences should be included when evaluating a patient's caries risk status. Thus it's evident that these kind of advancements help us in the detection of causes and risk of caries as early as possible and thus we will be able to treat it early as well as appropriately. Despite all these advances, it is still a challenging approach and needs more improvements for early recognition and prevention of dental caries.[26]

To conclude "Every child has a fundamental right to his total oral health". Early implementation of preventive strategies can reduce the morbidity of this common disease process. Thus it is the duty of every educated citizen to illuminate the rest about the impact of caries and hence, enlighten them towards better oral health.[27]

LEGEND:

FIGURE 1: Factors for caries development
FIGURE 2: Caries risk indicators
FIGURE 3: Caries Risk Assessment Form (0-6 years)
FIGURE 4: Cariogram assessment chart
FIGURE 5: Cariometer app
FIGURE 6: Traffic light matrix assessment chart
FIGURE 7: Lactic acid impression - culture method

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