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CARIES RISK ASSESSMENT: UTILIZATION IN DIFFERENT DENTAL CARE SETTINGS – AN OVERVIEW

Dental Science

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ABSTRACT

Dental caries is a chronic, transmissible disease of multifactorial etiology. Over the decades, landmark researches have given a deeper insight into the etiology of dental caries and has led to the transformation of operative dentistry philosophy. Caries Risk Assessment [CRA] has become a corner stone in contemporary dental care practice, relevant to all age groups which helps the clinician to plan appropriate treatment modalities and preventive measures tailored to the patient's risk profile. CRA application has been widely used in different dental care settings for successful clinical outcomes. This review considers to summarize these research findings ranging from its clinical applicability domain to health promotion initiatives including its utility in community based settings and predicting the possibilities of patient specific non-communicable diseases. It also briefs about recent technological advancements in CRA which is easy to administer, simple, quick and beneficial for effective dental caries management.

KEYWORDS

Caries Risk Assessment, Dental Care Settings, CAMBRA, Cariogram

INTRODUCTION:

Modern caries management is based on evidence-based dentistry, with a more intense focus on prevention. Although there is considerable variability between dentists, there is more emphasis on preventive dentistry than ever before.[1] The paradigm shifts from treatment centric to patient centered approach has been emphasized in dental schools in which curriculum and practical skills are focused more on caries risk assessment and management. Caries Risk Assessment [CRA] is the determination of the likelihood of the incidence of caries during a certain time period or a change in the size or activity of lesions already present, with the ability to detect caries in its earliest stages.[2]

In the last 3 decades, Dental researchers across the world have developed various caries risk assessment tools like the American Academy of Pediatric Dentistry (AAPD)'s CRA form, Caries Management by Risk Assessment [CAMBRA], Caries Assessment and Risk Evaluation Test [CARE], Cariogram Model, Traffic Light Matrix Model etc [3] to help dental clinicians to categorize the level of the patient's risk of developing caries, to assist targeted treatment planning based on the primary etiological factors for caries development, application of preventive measures tailored to patient's risk profile, achieve better prognosis and encourage patient to maintain optimum oral health.

Various isolated studies including systematic reviews have suggested that CRA models play a very important role in assessing and predicting caries lesions for patients with different age groups, helping the dental clinicians to plan and initiate appropriate preventive applications considering individual's specific etiological caries risk factors, helping them to reduce their risk profiles.[4,5]

So, the present review considers to collate and summarize various studies focusing on the utilization of caries risk assessment protocols in different dental health care settings, where it is considered as an important didactic and preventive tool encouraging and motivating patients to shift from high / moderate caries risk to low caries risk category.

METHODOLOGY:

A literature search was performed in PUBMED database using the MeSH terms “Dental Caries” “Risk Assessment” & “Dental Care Settings” with appropriate use of Boolean Operators. The search strategy was confined to studies from the last 20 years only with English-language source and concerning humans. Snowballing method was used to find additional relevant articles by using Google Scholar, Research gate and grey literature.

The intent of this literature search was to identify and review the studies with potential areas in dental health care settings using caries risk assessment and management by developing newer treatment modalities for patients at varied risk of developing caries.

RESULTS

A number of studies have used Caries Risk Assessment in various dental health care settings for risk prediction and planning preventive dental health care programs. Multiple risk assessment tools have been used based on the targeted population and age appropriateness. The findings of the literature search are organized and discussed in relation to the disciplines and settings where risk assessment is of much importance for caries prevention.

Pediatric Dentistry

Innovative interventions are the need of the hour for prevention and management of ECC among young children. The alarming rise in the global epidemic of ECC calls for adoption of CRA to determine the caries risk of the pediatric patients by clinicians in their practice to achieve desirable preventive and treatment outcomes.[6] A study done in US has used CAMBRA-CRA in pediatric patients for assessing the risk profile and treated them by adding on chemical therapy (antibacterial plus fluoride) to the conventional restorative treatment and observed that there was a reduction in the caries increment by 20% - 38% in high caries risk patients.[7]

Orthodontics

It is well known that orthodontic therapy, especially fixed appliances increases the risk of carious lesions, resulting in unfavorable treatment outcomes including treatment failure and prolonged treatment time. This can be attributed to the appliances, which increase the number of sites of plaque accumulation, changes in oral microflora. The use of conventional oral hygiene methods for plaque removal is more difficult, the clearance of plaque and carbohydrates by saliva is also reduced. A thorough caries risk assessment is therefore needed before any appliance is put in place and further evaluations should then be performed regularly throughout the course of treatment.[8,9]

Prosthetic Dentistry

Patients having Fixed Partial Dentures / Removable Partial Dentures are at risk for developing recurrent caries on abutment teeth, where the mean caries rate diagnosed affecting the abutment tooth is 18%, which clearly indicates the lack of preventive measures. So, caries risk assessment among these patients will lead to effective treatment and outcomes.[10] A study done in US emphasizes caries risk assessment especially among prosthodontic patients with scleroderma, medically

comprised or elderly patients with xerostomia and emphasize use of silver diamine as a minimally invasive solution to arrest & prevent new caries with the goal of maintaining prosthesis and supporting teeth in cost effective manner.[11]

Geriatric Dentistry

Globally, the caries risk among elderly population has increased over the years. Increase in the root caries prevalence, number of restored teeth and edentulousness accounts an upsurge of 30% in the last 2 decades. This targeted group carries additional caries risk factors like inadequate oral hygiene, reduced saliva flow, presence of partial dentures, long term medications & compromised immune system. Evaluating risk levels and considering evidence-based treatment alternatives are one of the best possibilities to balance between protective factors compared to pathologic factors in elderly patients.[12] A study conducted in Netherland among dental practice-based research network demonstrated that CRA played an important decision making strategy for rendering preventive instructions and customized treatment plan for patients with high caries risk profile.[13]

Special Care Dentistry

The term "special health care needs" encompasses a wide range of diagnoses, and age groups. Not all patients with special health care needs are at high risk of developing caries, however, assessment of the patient's need for a cariogenic diet, use of medications in the form of sugary suspensions, medications and procedures like radiation therapy which can cause hyposalivation and subsequent xerostomia, inability to maintain adequate oral hygiene, decreased salivary buffering capacity, and other condition-specific caries risk factors with the help of CRA tools can help caregivers identify successful prevention strategies, also predict the incidence of future caries in hospital-based dentistry.[14,15]

Use of Caries Risk Assessment in community-based Settings:

CRA models have been widely implemented in public health settings. A study done in Israel demonstrates that Mother and Child Health Centers provide free preventive services for pregnant women and children by public health nurses, by using a caries risk assessment tool and treatment system, which has become an integral part of their toolkit.[16] CRA Model helps public health administrators by exhibiting a high level of sensitivity and specificity, especially to be used in crucial environments where resources are scarce and disease management is invasive and costly to the patient. It will also identify those at risk for caries development, that may be costlier and painful to the patient due to the progression of undiagnosed disease.

The potential benefits of Common Risk Factor Approach are far greater than isolated interventions. The need of the hour is that the common risk factors between general and oral health provide a rationale for dental health professionals to partner with community members to develop health promotion programs that will benefit a multitude of individuals.[17] In this direction, studies have shown that there is possible association between dental caries, cardiovascular diseases and Type II Diabetes Mellitus.[18,19] So, CRA will serve as a valuable risk indicator for dental clinicians to provide appropriate dental care and timely referrals to medical practitioners.

Smartphones are increasingly used in oral health promotion.[20] Cariometer, an android smartphone application estimating the caries risk based on the diet and oral hygiene has been developed to increase the cooperation and involvement of patients in caries prevention. A significant improvement in the dietary habits before and after the use of Cariometer has been reported.[21]

CRA in the Indian context

Few studies have evaluated the effectiveness of Cariogram models and observed that the model was effective in increasing the chance to avoid caries, depicting to be having good predicting and preventive ability.[22,23] Indeed, studies have also reported that Dental professionals with institutional attachment were better aware of the importance of CRA and practiced it more frequently as compared to the dentists who were solely attached with a private practice.[2,24]

Conclusion

Caries Risk analysis is an important component of health promotion and therefore all efforts must be made to evaluate existing tools as also develop easy to use tools that can be applicable in a wide range of settings with access to all the stake holders involved in oral health promotion activities.

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