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"ASSESSMENT OF CARIES RISK USING CARIES RISK ASSESSMENT TOOL AMONGST 12-15 YEARS OLD CHILDREN IN MORADABAD CITY- AN EPIDEMIOLOGICAL STUDY"

Research Paper

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ABSTRACT: Aims and Objectives: To assess the caries risk in 12-15 year old children in Moradabad city by utilizing caries risk assessment tool.

Settings & Design: A cross-sectional study was conducted on 2000 school going children of age 12-15 years in Moradabad city.

Material & Methods: A survey was conducted on 2000 school going children of age 12-15 years. The children were interviewed by the questionnaire based on The Caries Risk Assessment Tool. For those children, who didn't have visible caries, caries activity test was done. The subjects assigned, as low, moderate, and high-risk groups based on standard questionnaires and caries activity test. Statistical analysis of the data was done using chai square test.

Results: All the parameters viz; frequency of routine dental visits, decay in some teeth, salivary impairment, time of decay, plaque, gingivitis, area of demineralization, deep pits and fissures, sibling's decay, socio-economic status of the child's parents, in-between meal sugar exposure, fluoride exposure, brushing technique, caries activity test (for the subjects without visible caries),and wearing braces except motor disability (none of the subjects had motor disability) have significant impact on caries risk.

Conclusion: Almost all factors showed significant impact upon the caries risk. Caries found to decrease with increase in dental visits and frequency of brushing.

Keywords:
Caries, Questionnaire, Risk Assessment Tool.

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No conflicts of interest : Nil

INTRODUCTION : Dental caries is an infectious disease of the teeth that results in localized dissolution and destruction of the calcified tissues (1). Caries development involves a combination of factors including diet, a susceptible host, and microflora that interplay with a variety of social, cultural, and behavioral risk factors (2).

Dental caries is a major oral health problem in industrialized countries and is increasing in developing countries, affecting 60-90% of school-going children (3). The prevalence of dental caries ranges from 33.7% to 90% in the child population and is increasing at an alarming rate (4).

Over the past 15 years, strategies for managing dental caries have increasingly emphasized the concept of risk assessment. However, a practical tool for assessing caries risk in infants, children, and adolescents has been lacking. In 2002, the American Academy of Pediatric Dentistry (AAPD) took the first step toward incorporating available evidence into a framework for classifying caries risk in infants, children, and adolescents (2).

The assessment of all risk factors allows for both a more accurate assessment of risk of developing the disease, and identification of the etiologic factors responsible for the disease in a particular patient. Studies have indicated that for the success of a caries-risk assessment model, one or more

social, behavioral, microbiologic, environmental, and clinical variables should be included (2).

Dramatic improvements in the oral health of children in many developed countries have been recorded recently. As a result the need for targeted prevention of dental caries has become apparent since children in minority groups experience the majority of the disease burden (5).

Consequently, caries-risk assessment may be useful in the clinical management of caries by helping dental professionals to make the best decisions regarding care for their patients (6).

Dental caries progression or reversal depends upon the balance between demineralization and remineralization and can be visualized for clinical purposes as the "caries balance." A structured caries risk assessment should be carried out based upon the concept of the caries balance. Following the risk assessment, a treatment plan is devised which leads to the control of dental caries for the patient (7).

AIMS AND OBJECTIVES : This study utilized a clinically oriented questionnaire derived from the AAPD (2013) "Caries-risk Assessment Tool" (CAT) to:

asess the caries risks in 12-15 year old children attending school in Moradabad city, and to classify them into different risk groups.

Convey to individuals the level of caries risk to plan the modalities of treatment they should undertake depending upon their level of caries risk.

MATERIAL AND METHODS : Twenty schools were randomly selected from the list of schools in Moradabad City to obtain a sample of 2000 children. The study included male and female school children between 12-15 years of age.

pilot study was conducted among a similar population using the intended instrument. Based on the findings of the pilot study, the required sample size for the study was estimated to be around 2000 students.

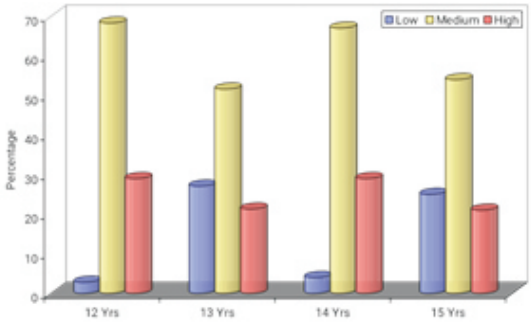
clinically oriented questionnaire derived from CAT was used to guide the examination of the participants. A verbal assessment and oral examination were conducted on each of the participants to complete survey items as necessary.

he oral examination was conducted in a mobile dental van using a disposable mouth mask, disposable gloves, a plain mouth mirror, tweezers, moon' probe, kidney tray, sterile gauze, cotton rolls, and pH strips. The pH strips were used to measure the pH of saliva by dipping it into a cup of collected saliva and comparing/matching to the provided color chart indicating the level of acidity by the colr change. The diagnostic instruments were sterilized using autoclave prior to each use, and surface disinfectants were used to clean the surfaces near the examination area, and as otherwise necessary.

ermission to conduct the survey in selected schools of Moradabad City was obtained from respective school authorities. The study was reviewed and cleared by the ethical committee of Kothiwal Dental College and Research Center Moradabad.

TATISTICAL ANALYSIS : tatistical analyses were conducted using SPSS. Descriptive analyses and chi-squared test were conducted using an alpha of 0.05.

RESULTS : total of 2000 school children 12-15 years of age participated in the study. Of these, 14.9%, 60.2%, and 24.9% had low, medium, and high caries risk respectively. Fmales had significantly higher proportion of subjects with moderate and high risk of caries overall and for the 12-13 year age group when compared to males. Females also had higher risk of caries in the 14-year age group when compared to males, but the



Table/Fig-1 Association between caries risk and age of participants. N=2000, p>0.001

difference was not significant (p=0.056). No gender comparisons could be made in the 15-year age group since there were no cases among females. None of the subjects reported motor disability.

One hundred subjects who reported never visiting the dentist had high caries-risk, subjects who reported visiting the dentist irregularly had both high (398) and moderate (602) caries risks. Of the 900 subjects who reported visiting the dentist regularly, 297 had low risk and 603 had moderate risk for caries. There was an inverse correlation between caries risk and regularity of dental visits (p<0.001).

Absence of dental decay was reported in 1502 subjects; of these 297 had low caries-risk, 1205 subjects had moderate caries-risk, and 498 were at high risk for caries. All the cases with dental decay had high caries-risk (p<0.001).

Ninety-eight of the subjects had salivary impairment and were screened to be at high risk for caries. The remaining

1902 subjects did not have salivary impairment; of these 297, 1205, and 400 were determined to be at low, moderate, and high caries-risk respectively. Salivary impairment was significantly associated with higher prevalence of caries ($p<0.001$).

In this study, 498 subjects reported the presence of decay, among them 98 had 12-24 months old decay, and 400 had more than 24 months old decay.

Plaque was visible among 498 of the subjects; the remaining 1502 subjects had no visible plaque. Only the 498 subjects who had visible plaque were at high risk for caries. Among the 1502 subjects who had no visible plaque, 297 were low risk and 1205 were moderate risk subjects. There was a significant relationship between visible plaque and caries risk ($p<0.001$).

Gingivitis was reported by 300 subjects and all of these subjects were at high caries-risk. The remaining 1700 subjects fell into all three risk categories: 300 low, 1202 moderate, and 198 high risk. There is a relationship between the presence of gingivitis and caries risk ($p<0.001$).

Two hundred and ninety-eight subjects were found to have more than one area of demineralization, 602 had one area of demineralization, and 1100 were found to have no demineralization. Those with more than one area of demineralization fell into the high-risk category. There were subjects in both moderate and high-risk groups who had one area of demineralization. Of those who had no demineralization, 300 were low risk and 800 were moderate risk. The impact of area of enamel demineralization found to be highly significant on caries risk ($p <0.001$).

Enamel defects were found for 100 subjects all of whom are high risk. Of the remaining 1900 subjects who had no enamel effects, 300, 1202, and 398 were low, moderate, and high risk respectively. There was a significant relationship between enamel defects and caries risk ($p<0.001$).

Although visibility of plaque, gingivitis, demineralization and enamel defects were significantly associated with higher caries-risk, absence of these conditions did not predict against a moderate to high risk of caries ($p<0.001$).

Three hundred subjects reported that their siblings had decay, these participants screened as high risk. Among the remaining 1700 participants who reported that their sibling had no decay, 302 were low risk, 1200 were moderate risk, and 198 were high risk. There is a relationship between sibling decay and caries-risk ($p<0.001$).

Sugar exposure more than once a day between meals was reported by 498 participants who all screened as high risk. Participants who reported sugar exposure once a day between meals; (902) were in the moderate-risk category. The remaining 600 participants had sugar exposure only during mealtime; 300 were low risk and 300 were moderate risk. Increased sugar consumption was associated with increased caries risk ($p<0.001$).

All the subjects had exposure to fluoride either in fluoride toothpaste, or from water with the almost optimum level of fluoride. Among the participants 297 were low risk, 120 moderate risk, and 498 high risk.

Out of 2000 subjects, 600 subjects belonged to low socio-economic status and screened as high-risk individuals, 1100 subjects belonged to moderate socio-economic status, fell under both moderate (1000) and high-risk (100) category. While 300 subjects who belonged to high socio-economic status fell into low-risk category. The impact of socio-economic status was found to be highly significant on caries risk ($p <0.001$).

Tooth brushing less than once per day was reported among 398 participants, all of whom were high risk. Subjects who reported brushing once a day (602) had 502 with moderate risk and 100 high risk. The remaining 1000 subjects who reported brushing 2-3 times daily had 300 low risk and 700 of moderate risk. Higher brushing frequency was significantly associated with lower caries risk, but it did not predict against moderate risk of caries ($p<0.001$).

Low caries activity was reported among 400 participants; 300 low risk and 100 high risk. Moderate caries activity was reported by 1102 subjects, all of whom had moderate caries risk, and 498 had high caries activity and high caries-risk. Increased caries activity had a significant association with caries risk ($p<0.001$).

Braces were worn b 398 subjects, all of who were at high caries-risk. Of the remaining participants who didn't wear braces, 300 were low risk, 1202 moderate risk, and 100 high risk. Wearing of braces had a significant association with higher caries risk ($p<0.001$).

DISCUSSION : The present study was done to assess the caries risk in the population and to analyze the clinical utility of risk assessment. The caries risk assessment considers the caries to be multifactorial, therefore the following factors were considered.

Frequency of dental visits:

Consistent with the findings of Adekoya et al. (8), there is a clear tendency for caries risk to decrease with increased dental visits. Cadavid et at. (2009) also observed the same relationship between caries and dental visits (9)

Presence/absence of decay:

Despite decay having a significant relationship with caries risk, some participants without decay were still at moderate risk for caries. This indicates that other factors were responsible for the subjects to be considered moderate risk, and supports research suggesting the mulifactorial nature of caries.

Conditions impairing salivary secretions:

Ideally subject experiencing salivary impairment should screen as high risk, and those without as low risk. In the given study however, subjects without salivary impairment fell into all 3 risk levels. This would suggest that the moderate and high risk indicated in subjects with no salivary impairment is due to other factors. This once again suppors the theory that caries are multifactorial.

One of the most important factors which influence the development of dental caries is saliva. The physicochemical properties of saliva like pH, buffering capacity, salivary flow rate, concentration of various components like proteins, calcium and antioxidant defense system play a major role in the development of caries (10).

Time elapsed since last decay:

The presence of decay alone classifies the individuals into the high risk category. Knowledge of the timing of decay will allow clinicians to contemplate and undertake various treatment modalities viz preventive, restorative and corrective.

Visible plaque:

The significant but low correlation between plaque and caries scores supports an etiological role that plaque plays in caries development, but emphasizes the importance of other factors which also play a role in the development of this dental disease (11).

Contrarily, studies have shown that fluoride in saliva may promote remineralization and (especially fluoride in plaque) inhibit demineralization, thus indicating plaque may have a beneficial effect (12).

Gingivitis:

Social class and oral hygiene behavior were important risk indicators for the level of oral cleanliness and presence of gingivitis. Studies show that the strongest predictor of gingivitis is plaque (13).

Areas of enamel demineralization:

Subjects having low and moderate risk with respect to areas of demineralization, must be exposed to other high risk and dominating factors, causing them to still have high caries-risk.

Enamel defects:

The presence of enamel defects alone is not the only factor to screen the subjects as high-risk individuals. The risk of caries is governed by interplay of several other factors.

Studies have shown however, that enamel defects were associated with an increased caries incidence (14).

Siblings' decay:

The results of the study (Bretz et al.) conducted in a large cohort of young twins have clearly demonstrated that dental caries traits have a significant genetic contribution and that microbial acid production is essentially modulated by the environment (15).

Boraas et al. (1988) provided evidence for a marked genetic component to dentate status and dental caries status (16). It also provides strong support for the earlier studies that had implicated hereditary contribution to tooth size, dental malalignment, occlusion, and tooth morphology (17).

Socio-economic status (SES):

Some of the subjects with moderate SES, are exposed to high risk factors, which cause them to be at high caries-risk. Subjects with high SES, are also impacted by other low risk factors allowing them to be categorized as low caries-risk individuals.

Nicolau, et al. showed low levels of education of the mothers and fathers are stable measures of socio-economic conditions throughout life (18). Thus it is plausible that an adverse socio-economic environment at birth and throughout the upbringing of a child with reduced biological resources reduces the chances of consuming a healthy diet and gaining access to dental services (18). It also reduces the likelihood of adopting behavior such as frequent tooth-brushing with fluoride toothpaste, which in turn increases the risk of having high levels of dental caries experience in adolescence (18).

It should be noted however, that socio-economic level is not a causal factor per se, but that it affects caries incidence through other variables. Detection of these variables is probably the key to understanding how to offer better preventive care for caries (19).

Sugar exposure:

Frequent consumption of fermentable carbohydrates, including sucrose, has a role in the etiology of dental caries. However, this role is substantially reduced when oral hygiene with use of fluoride toothpaste is adequate. Efforts to prevent dental caries should focus on achieving adequate oral hygiene practices with fluoride toothpaste as this has proven to provide a much greater reduction in caries experience than dietary modification. Dietary advice for the reduction of

dental caries risk should focus on limiting the frequency of exposure to all fermentable carbohydrates (20).

Fluoride exposure:

Subjects with high fluoride exposure fell into all 3 risk categories for caries. This however doesn't exclude fluoride as caries inhibiting agent (300 subjects being low risk) rather it indicates caries being multifactorial in nature.

Fluoride works primarily via topical mechanisms which include 1) inhibition of demineralization at crystal surfaces inside the tooth 2) enhancement of remineralization at crystal surfaces (the resulting remineralized layer is very resistant to acid attack) and 3) inhibition of bacterial enzymes (7).

Systematic reviews have concluded that water fluoridation and use of fluoride toothpastes and mouth rinses significantly reduce the prevalence of dental caries. WHO recommends for public health that every effort must be made to develop affordable fluoridated toothpastes for use in developing countries (21).

Brushing frequency:

The results of this study regarding tooth brushing frequency are supported by studies which show that a higher frequency of tooth brushing correlates with a lower prevalence and incidence of caries, although very often results do not reach clinical significance. Tooth brushing frequency and oral hygiene, among other factors, act as risk indicators for the development of carious lesions. These factors should be reflected in the design of oral health education material and taken into account in the design and analysis of caries clinical trials (22).

Caries Activity:

In this study caries activity was found to have a significant impact on caries risk.

Wearing braces:

All subjects who wore braces were found to have high caries-risk. Those who do not wear braces fell into all 3 risk categories. Again this indicates the interplay of several other factors to determine the risk.

Orthodontic treatment is most often applied during adolescence, when the permanent teeth have recently erupted and so are more vulnerable to caries because of their young enamel. This greatly compounds the risk of caries, and so orthodontic treatment at this age will favor the formation of carious lesions. These can be caries in pits and grooves, which make up more than 60% of lesions diagnosed (23).

CONCLUSION : As per present study's result almost all the factors found to have positive co-relation with caries and had significant impact as caries risk determinant. Most of the children fell under moderate risk (60%). The low and high-risk groups were 15% and 25% respectively.

All the risk factors had significant impact upon the caries risk; this indicates applicability of CAT as a tool, which will keep helping the clinicians to recognize the individuals at risk. Also, as the risks are graded so they can rule out the urgency or priority for different modalities of treatment.

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